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ABSTRACT

CASAS (Comprehensive Adult Student Assessment System) and ACT (American College Testing) have separately developed systems to identify the skills needed in the workplace. A research project studied the relationship between CASAS' Workforce Learning Systems (WLS) and ACT's Work Keys to determine how the systems could be linked to support individuals as they move up the employability skills ladder. The project first conducted a content and cognitive review to verify three assumptions: workplace skills can be viewed as a continuous and progressive process; the two systems provide high quality assessment tools; and there is a link between the systems. An empirical study addressed two research questions: whether the two assessments in reading and mathematics are sufficiently correlated to permit meaningful articulation, and whether the two assessments in reading and mathematics are different enough in the range of skill levels covered so that articulation will extend the total range of skills covered in individual assessments.Study participants took either the WLS (n=383) or the Work Keys (n=367) reading assessment and either the WLS (n=379) or the Work Keys (n=347) mathematics assessment. The final matched sample contained 494 participants. Results showed that the two systems are sufficiently correlated and sufficiently different to make an integration feasible and useful. It was recommended that educators, trainers, and human resource managers use the systems in tandem for developing workplace learning programs and placing individual learners. (The report contains 16 references. Appendices include a list of data collection sites, proposal letter, sample assessment items, examinees with usable scores by state and site, and relationship between participants and typical examinees.) (KC)

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EXTENDING THE LADDER

From CASAS to Work Keys Assessments

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ACT
Information for Life's Transitions

WORKKEYS

CASAS

Workforce Learning Systems

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Final Report

Extending the Ladder:

From CASAS to Work Keys Assessments

1997

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Executive Summary

Overview

Life-long learning is the watchword of the day. All across America people are increasingly aware that staying productive and competitive in the workplace requires staying current, and staying current requires continuous investments in skill development. No longer is this the concern only of those in the education and training sectors, employers and employees are reaching this conclusion as well.

Extending the Ladder focuses on the nation's investments in skill development. It shows how assessment systems from two of our country's premier testing organizations — the Comprehensive Adult Student Assessment System (CASAS) and ACT — can be linked to guide individuals' education and training as they progress from basic literacy skills to the level of advanced skills required to succeed in an increasingly complex economy.

CASAS' Workforce Learning Systems provides high quality, valuable assessments of the *basic skills* needed in the workplace. ACT's Work Keys system provides high quality, valuable assessments of *more advanced skills* required for employees to be productive in the workplace. Given these different levels, these two assessment systems complement each other to form a comprehensive assessment system.

CASAS and the Workforce Learning Systems

CASAS began developing its Workforce Learning Systems in the mid 1980s to promote *workplace learning* and *workforce preparation*. The tools included in the Workforce Learning Systems are designed for an employment context, targeting both those currently employed and those pursuing employment (the Employability Competency System series). Workforce Learning Systems is designed to assess and to meet the training needs of today's diverse workforce, including native and non-native English speakers. Over 12 years of continuing research and development have ensured the system is relevant to today's job and skill requirements.[1]

[1] For more information on CASAS, the Workforce Learning Systems, and the Employability Competency System, contact CASAS, 8910 Clairemont Mesa Boulevard, San Diego, CA 92123-1104; telephone (619)292-2900 or (800)255-1036; fax (619)292-2910; or visit the CASAS home page on the Internet at http://www.casas.org.

Workforce Learning Systems tools include four key components:

- A **Workplace Analysis** that identifies the basic skills and skill levels required by employees at a work site for continuous quality improvement.

- **Workplace Appraisals** that determine individuals' actual skill levels, and provide pertinent information required for establishing training standards and goals.

- An **Instructional Materials Guide** that helps trainers locate the most appropriate curricula for developing and delivering work site training. The guide correlates over 1,000 commercially available instructional textbooks, videos, and software programs to more than 300 competency statements (or learning objectives).

- **Standardized**, including **Performance-Based, Assessments** that measure learners' progress and certify their skill attainment, evaluate program results, and provide a reporting system.

Employability Competency System Appraisal

The Employability Competency System (ECS), a part of the Workforce Learning Systems, focuses on workplace skills, but places a heavier emphasis on skills for *accessing* the labor market than do other parts of the Workforce Learning Systems. The ECS includes appraisals and diagnostic tests to assess individuals' employability competencies and shape appropriate training strategies.

ECS appraisals predict individuals' general reading and mathematics functional levels, while the more targeted Reading and Mathematics for Employability pre-tests provide the diagnostic information needed to design and deliver appropriate training. ECS pre-employment and work maturity checklists provide standardized forms for rating individuals' career awareness and ability to interview and fill out job applications. A reporting system provides useful information to learners and program staff.

CASAS assessment instruments measure a wide range of skill levels, providing accurate assessments for individuals with special learning needs on up to those with high school completion level skills. CASAS assessments are scored from below 150 to above 250, and classified along a five-level scale ranging from Levels A through E. Clear and easily understood "competency descriptors" provide information detailing the skills of individuals scoring within each of the five levels. The scaled scores, score levels, and competency descriptors are contained in Table 1.

CASAS chose to use the ECS reading and mathematics appraisals, form 130, for this study because it assesses individuals' strengths and weaknesses *in relation to the basic skills necessary to obtain and to retain a job.*

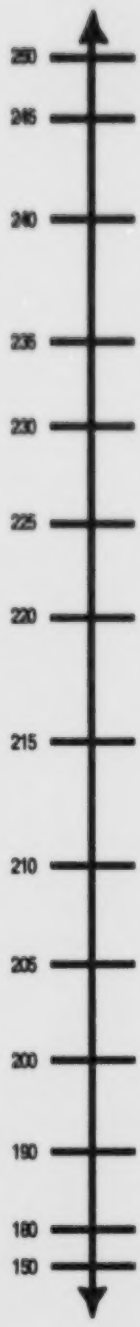

Table 1
CASAS Basic Skills Levels

CASAS Level	Competency Descriptors
E	**Advanced Adult Secondary** With some assistance, persons at this level are able to interpret technical information, more complex manuals, and material safety data sheets (MSDS). Can comprehend some college textbooks and apprenticeship manuals.
D	**Adult Secondary** Can read and follow multi-step directions; read and interpret common legal forms and manuals; use math in business, such as calculating discounts; create and use tables and graphs; communicate personal opinion in written form; write an accident or incident report. Can integrate information from multiple texts, charts, and graphs as well as evaluate and organize information. Can perform tasks that involve oral and written instructions in both familiar and unfamiliar situations.
C	**Advanced Basic Skills** Can handle most routine reading, writing, and computational tasks related to their life roles. Can interpret routine charts, graphs, and labels; read and interpret a simple handbook for employees; interpret a payroll stub; complete an order form and do calculations; compute tips; reconcile a bank statement; fill out medical information forms and job applications. Can follow multi-step diagrams and written instructions; maintain a family budget; and write a simple accident or incident report. Can handle jobs and job training situations that involve following oral and simple written instructions and diagrams. Persons at the upper end of this score range are able to begin GED preparation.
B	**Intermediate Basic Skills** Can handle basic reading, writing, and computational tasks related to their life roles. Can read and interpret simplified and some authentic materials on familiar topics. Can interpret simple charts, graphs, and labels; interpret a basic payroll stub; follow basic written instructions and diagrams. Can complete a simple order form and do calculations; fill out basic medical information forms and basic job applications; follow basic oral and written instructions and diagrams. Can handle jobs and/or job training that involve following basic oral or written instructions and diagrams if they can be clarified orally. **Beginning Basic Skills** Can fill out simple forms requiring basic personal information, write a simple list or telephone message, calculate a single simple operation when numbers are given, and make simple change. Can read and interpret simple sentences on familiar topics. Can read and interpret simple directions, signs, maps, and simple menus. Can handle entry level jobs that involve some simple written communication.
A	**Pre-Literacy** Very limited ability to read or write. Persons at the upper end of this score range can read and write numbers and letters and simple words and phrases related to immediate needs. Can provide very basic personal identification in written form such as on job applications. Can handle routine entry level jobs that require only basic written communication.

CASAS, 1997

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ACT and Work Keys

ACT's Work Keys system was developed to remedy crucial basic skill deficiencies in the nation's current and future workforce. Work Keys helps employers identify skill levels required by their jobs, select qualified applicants, and communicate skill requirements to future employees and their instructors. Work Keys job profiling supports employers' use of Work Key scores for job selection by addressing Equal Employment Opportunity Commission (EEOC) content validation requirements. By linking required skill levels to hiring decisions, employers make their "admission standards" public. Work Keys also calculates occupational profiles — summaries of job profiles across different companies — which help guide students and educators to develop those skills and skill levels.[2]

Work Keys consists of four components:

- **Assessments** that measure learners' workplace skills,
- A **job profiling** system that determines the skills required for competent performance in specific jobs,
- **Instructional support** that helps instructors teach necessary skills, and
- A **research and reporting** system that provides timely and useful information to Work Keys participants.

Work Keys Assessments

Work Keys currently supports the skill areas of Applied Mathematics, Listening, Writing, Reading for Information, Applied Technology, Locating Information, Teamwork, and Observation. For each skill area, a common skill scale provides the links between job profiling, assessments, and instructional support.

The Work Keys assessments were developed under the guidance of panels comprised of educators and employers. The lowest level of a skill is identified as the simplest level for which a business or industry would be interested in administering an assessment for hiring purposes. Typically that level is well above "none" of the skill, and for this reason, that level has generally been given the name "Level 3."

The highest skill level is identified as the most complex level at which an employee might be expected to function without specialized training. Once the top and bottom levels are described, the panel determines about how many levels can be distinguished from the bottom to the top of the scale, and these levels are named by counting up from the lowest (level 3, level 4, level 5, etc.). The skill levels for the reading and mathematics assessments are described in Tables 2 and 3. These measure examinees on a scale from 3 to 7.

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[2] For more information on ACT and the Work Keys system, contact ACT, 2201 North Dodge Street, P.O. Box 168, Iowa City, Iowa 52243; telephone (800)WORKKEY; fax (319)337-1725; or visit the ACT home page on the Internet at http://www.act.org.

Table 2
Work Keys Reading for Information

Work Keys Level	Level Description
3	Questions at Level 3 measure the examiner's skill in reading short, uncomplicated passages which use elementary vocabulary. The reading materials include basic company policies, procedures, and announcements. All of the information needed to answer the questions is stated clearly in the reading materials, and the questions focus on the main points of the passages. At this level, the wording of the questions and answers is similar or identical to the wording used in the reading materials. Questions at Level 3 require the examinee to •identify uncomplicated key concepts and simple details; •recognize the proper placement of a step in a sequence of events, or the proper time to perform a task; •identify the meaning of a word that is defined within the passage; •identify the meaning of a simple word that is not defined within the passage; and •recognize the application of instructions given in the passage to situations that are also described in the passage.
4	At Level 4, the reading passages are slightly more complex than those at Level 3. They contain more detail and describe procedures which involve a greater number of steps. Some passages describe policies and procedures with a variety of factors which must be considered in order to decide on appropriate behavior. The vocabulary, while elementary, includes words that are more difficult than those at Level 3. For example, the word "immediately" may be used at this level, whereas at Level 3 the phrase "right away" would be used. At this level, the questions and answers are paraphrased from the passage. In addition to the skills tested at the preceding level, questions at Level 4 require the examinee to •identify important details that are less obvious than those in Level 3; •recognize the application of more complex instructions, some of which involve several steps, to describe situations; and •recognize cause-effect relationships.
5	Passages at Level 5 are more detailed, more complicated, and cover broader topics than those at Level 4. Words and phrases may be specialized (e.g., jargon and technical terms), and some words may have multiple meanings. Questions at this level typically call for applying information given in the passage to a situation that is not specifically described in the passage. All of the information needed to answer the questions is stated clearly in the passages, but the examinee may need to take several considerations into account in order to choose the correct responses. In addition to the skills tested at the preceding levels, questions at Level 5 require the examinee to •identify the paraphrased definition of a technical term or jargon that is defined in the passage; •recognize the application of technical terms or jargon to stated situations; •recognize the definition of an acronym that is defined in the passage; •identify the appropriate definition of a word with multiple meanings; •recognize the application of instructions from the passage to new situations that are similar to those described in the reading materials; and •recognize the application of more complex instructions to described situations, including conditionals and procedures with multiple steps.
6	Passages at Level 6 are significantly more difficult than those at the previous level. The presentation of the information is more complex; passages may include excerpts from regulatory and legal documents. The procedures and concepts described are more elaborate. Advanced vocabulary, jargon, and technical terms are used. Most information needed to answer the questions correctly is not clearly stated in the passages. The questions at this level require examinees to generalize beyond the stated situation, to recognize implied details, and to recognize the probable rationale behind policies and procedures. In addition to the skills tested at the preceding levels, questions at Level 6 require the examinee to •recognize the application of jargon or technical terms to new situations; •recognize the application of complex instructions to new situations; •recognize, from context, the less common meaning of a word with multiple meanings; •generalize from the passage to situations not described in the passage; •identify implied details; •explain the rationale behind a procedure, policy, or communication; and •generalize from the passage to a somewhat similar situation.
7	The questions at Level 7 are similar to those at Level 6 in that they require the examinee to generalize beyond the stated situation, to recognize implied details, and to recognize the probable rationale behind policies and procedures. However, the passages are more difficult; the density of information is higher; the concepts are more complex, and the vocabulary is more difficult. Passages include jargon and technical terms whose definitions must be derived from context. In addition to the skills tested at the proceeding levels, questions at Level 7 require the examinee to •recognize the definitions of difficult, uncommon jargon or technical terms, based on the context of the reading materials; and •figure out the general principles underlying described situations and apply them to situations neither described in nor completely similar to those in the passage.

ACT, 1997

Table 3 Work Keys Applied Mathematics	
Work Keys Level	**Level Description**
3	Problems at Level 3 measure the examinee's skill in performing basic mathematical operations (addition, subtraction, multiplication, and division) and conversions from one form to another, using whole numbers, fractions, decimals, or percentages. Solutions to problems at Level 3 are straightforward, involving a single type of mathematical operation. For example, the examinee might be required to add several numbers or to calculate the correct change in a simple financial transaction. Problems at this level translate easily from a verbal setup to a mathematical equation. All the information needed to solve the problems is provided in logical order and no unrelated information is included. Problem setups may include units of measurement. However, with the exception of dollars and cents, these units function solely as labels and are not involved in actual calculations.
4	Problems at Level 4 measure the examinee's skill in performing one or two mathematical operations, such as addition, subtraction, or multiplication, on several positive or negative numbers. (Division of negative numbers is not covered until Level 5.) Problems may require adding commonly known fractions, decimals, or percentages (e.g., 1/2, .75, 25%), or adding three fractions that share a common denominator. At this level, the examinee is also required to calculate averages, simple ratios, proportions, and rates, using whole numbers and decimals. Problems at this level require the examinee to reorder verbal information before performing calculations. The examinee must read the entire problem carefully to determine which operation(s) to perform and in what order. For some problems, examinees must read a simple chart or graph to obtain the information needed to solve the problem.
5	Problems at Level 5 require the examinee to look up and calculate single-step conversions within English or non-English systems of measurement (e.g., converting from ounces to pounds or from centimeters to meters) or between systems of measurement (e.g., converting from centimeters to inches). These problems also require calculations using mixed units (e.g., hours and minutes). Problems at this level contain several steps of logic and calculation. The examinee must determine what information, calculations, and unit conversions are needed to find a solution. For example, the examinee might be asked to calculate perimeters and areas of basic shapes, to calculate percent discounts or markups, or to complete a balance sheet or order form.
6	Problems at Level 6 measure the examinee's skill in using negative numbers, fractions, ratios, percentages, and mixed numbers in calculations. For example, the examinee might be required to calculate multiple rates, to find areas of rectangles or circles and volumes of rectangular solids, or to solve problems that compare production rates and pricing schemes. The examinee might need to transpose a formula before calculating or to look up and use two formulas in conversions within a system of measurement. Level 6 problems may also involve identifying and correcting errors in calculations. Problems at Level 6 may require considerable translation from verbal form to mathematical expression. They generally require considerable set-up and involve multiple-step calculations or conversions.
7	Problems at Level 7 require multiple steps of logic and calculation. For example, the examinee may be required to convert between systems of measurement that involve fractions, mixed numbers, decimals, or percentages; to calculate multiple areas and volumes of spheres, cylinders, and cones; to set up and manipulate complex ratios and proportions; or to determine the better economic value of several alternatives. Problems may involve more than one unknown, nonlinear functions, and application of basic statistical concepts (e.g., error of measurement). The examinee may be required to locate errors in multiple-step calculations. At this level, problem content or format may be unusual, and the information presented may be incomplete or implicit, requiring the examinee to derive the information needed to solve the problem from the setup.

ACT, 1997

Work Keys used the Reading for Information and Applied Mathematics assessments for this study since, of the Work Keys skill areas, these tests are the most closely aligned to the two CASAS ECS appraisals used in this study.

Extension Ladder: Workforce Learning Systems/Work Keys

Both CASAS' Workforce Learning Systems and ACT's Work Keys system are highly effective, workforce focused assessment systems. Neither, however, is targeted broadly enough to assess the extensive range of skill levels existent in America's workforce.

Separately, Workforce Learning Systems and the Work Keys system provide valuable information about individuals' basic skill levels. Together, they provide an "assessment continuum" that can be likened to an *extension ladder*, with the Workforce Learning Systems assessments forming the lower ladder rungs, and the Work Keys system assessments extending beyond the Workforce Learning Systems' highest skill levels and forming the higher ladder rungs (*see Figure 1*). There is a critical need for implementing a workforce focused assessment system that addresses the *broad continuum* of skill levels, from the "first rung of the ladder" (basic skills), up to the "top rungs of the ladder" (more advanced skills).

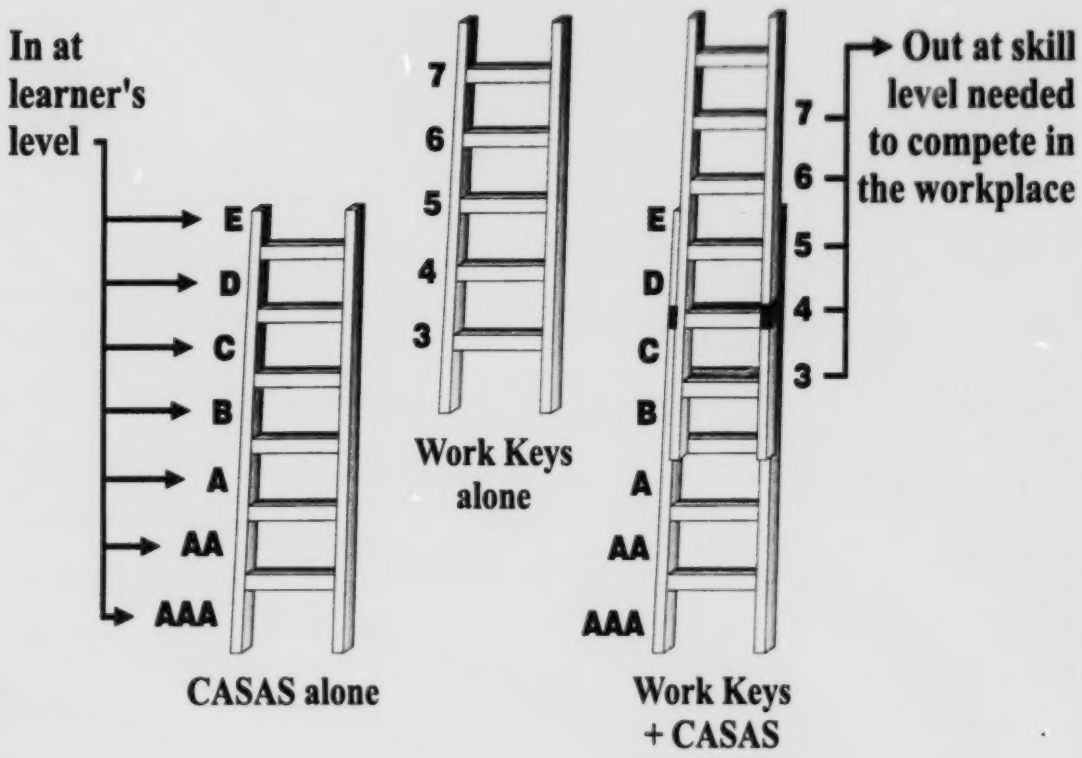
The *Extending the Ladder* project began with an assumption that CASAS' Workforce Learning Systems, which uses assessments and instructional materials tailored to the current skill levels of learners, will help individuals at the lower levels of the skills continuum begin to acquire the skills needed for a particular job or occupation. Individuals at the upper levels of the skills continuum need higher level assessments. The *Extending the Ladder* project began with the assumption that Work Keys system assessments would be better at measuring the more advanced skills these individuals would have.

The *Extending the Ladder* project assumed that individuals in the middle of the skills continuum might be well served by *both* assessment systems. Just as an extension ladder needs a solid, overlapping section to ensure its stability and structural integrity, the Workforce Learning Systems and Work Keys system would benefit from an overlap in skills assessment, in the middle of the continuum, to provide a smooth transition from one assessment system to the next. A strong correlation over some middle skill range would provide a useful transition from lower level basic skills to higher level, more advanced skills.

This study was designed to determine whether the Workforce Learning Systems and Work Keys system assessments can be linked to create an assessment scale *extension ladder* that can support learners throughout the skills acquisition process. If the two systems can be linked in this way, they will help learners begin their studies at their current skill levels, and continue their studies until they have acquired the skills needed for the jobs they are seeking. An added benefit is that workforce and worksite training programs will clearly see a solid link joining the Workforce Learning Systems and Work Keys system.

Figure 1

An Extension Ladder Approach to Lifelong Learning: CASAS/Work Keys



Research Plan

In order to help educators, trainers, employers, and employees better assess the skills individuals need to succeed in the workplace, ACT and CASAS established a plan to study the relationship between two of their assessment systems — ACT's Work Keys and CASAS' Workforce Learning Systems — to determine how the systems could be linked to support individuals as they move up the employability skills ladder. The two organizations have cooperated to better determine how linkages between the two systems might establish a comprehensive continuum of assessment to better support skills development.

Major Project Themes

- This research project was a joint cooperative venture between two private organizations, CASAS and ACT, to develop a comprehensive assessment model for the nation's workforce. This cooperative venture is one of an increasing number of workplace skill development initiatives envisioned by and carried out by mainstream private organizations.

- The effective use of these two systems, functioning in tandem, can identify training needs at the skill level of the individual and support continued training to the requisite levels mandated by business and industry for occupations requiring higher skill levels.

- Both systems use job analysis services and assessment services of individual skills to enable learners and employers to identify the skills needed for job success as well as identify the additional training needed to be productive on the job. Using this information, a trainer is better able to guide individuals as they prepare for and maintain successful performance in today's competitive workforce.

Project Assumptions

- Assessment of basic and advanced workplace skills can be viewed as a continuous and progressive process.

- CASAS' Workforce Learning Systems provides high quality, valuable assessments of the basic skills needed in the workplace.

- ACT's Work Keys system provides high quality, valuable assessments of more advanced skills required for employees in the workplace.

- CASAS' Workforce Learning Systems and ACT's Work Keys reading assessments measure similar content and have some overlap in the range of skill levels they measure. The Workforce Learning Systems and Work Keys mathematics assessments also measure similar content and have some overlap in the range of skill levels they measure.

- There is a complementary link between the Workforce Learning Systems and Work Keys system.

Goals and Objectives

The overarching goal of the *Extending the Ladder* project was to provide educators, trainers, employers and employees with a common language and articulated assessments for communicating about basic and advanced workplace skills and the standards for measuring them. Specific objectives included:

- Determining the degree to which CASAS' Workforce Learning Systems and ACT's Work Keys assessments can be linked to provide a continuous, progressive assessment system from basic through advanced workplace skills.
- Providing guidance on appropriate assessments as learners make the transition through skill levels on the Workforce Learning Systems and Work Keys assessment systems.
- Providing information to support establishing comprehensive assessment systems in a variety of workforce settings (e.g. secondary and postsecondary education programs, business and industry, workforce development centers, or social service agencies).

Research Questions

- Are the Workforce Learning Systems and Work Keys assessments in reading and mathematics sufficiently highly correlated in the range of skill levels covered to permit meaningful articulation of the two scales?
- Are the Workforce Learning Systems and Work Keys assessments in reading and mathematics different enough in the range of skill levels covered so that articulation of the two scales will extend the total range of skills covered in the individual assessments?

Methodology

The *Extending the Ladder* project team *first* conducted a content/cognitive review to verify the study's assumptions, and *then* conducted an empirical study to address the study's two research questions.

Content/Cognitive Review

The project's content/cognitive review verified the project's five assumptions. In order for the Workforce Learning Systems and Work Keys system assessments to be linked, they need to measure similar content (reading and mathematics), and they need to contain some items measuring skills at comparable levels of difficulty (the area of overlap on the extension ladder). The content/cognitive review found considerable similarity in the content measured by the two systems, with both systems relating assessment items to "real-life" workforce tasks, as opposed to academic tasks. The range of difficulty covered by the two systems' assessments also differ, and the review found enough overlap to make a link, and enough difference to make linking worthwhile.

Empirical Study

Once the assumptions were verified, the project team designed and conducted an empirical study to address the project's two research questions.

For the empirical study, adult learners were asked to take both ECS and Work Keys reading assessments, and/or both ECS and Work Keys mathematics assessments. Comparisons were then made, for each individual, between scores on the paired tests in order to determine the linkage between the ECS and Work Keys system assessments.

Site Selection. Data were collected from 27 sites across eight states. States were selected for participation from across the country. Participating sites were selected from locations with workforce literacy programs, to ensure that individuals participating in the assessments would represent the adult population in workforce literacy programs.

Participant Sampling Procedures. Sites were asked to randomly select 20 to 30 learners to participate in the study. To encourage participation, individuals were awarded dictionaries for taking the reading assessments and calculators for taking the mathematics assessments.

Instrumentation. Individuals participating in the reading study took both the ECS form 130 reading appraisal and the Work Keys Reading for Information assessment. Those participating in the mathematics study took both the ECS form 130 mathematics appraisal and the Work Keys Applied Mathematics assessment.

Data Collection. The study used scores from 494 individuals: 193 with only reading test scores, 163 with only mathematics test scores, and 138 with both reading and mathematics test scores.

Delimitations. The sampling method used for this study imposed some limitations on the use of the study results.

- The study results are useful in implementing a comprehensive assessment system including both the Workforce Learning Systems and Work Keys system. However, they are only relevant for the Workforce Learning System's ECS form 130 reading and mathematics appraisals and the Work Keys' Reading for Information and Applied Mathematics assessments, and not for any other Workforce Learning Systems or Work Keys assessments.

- Because the participants in this study came from workplace and workforce development programs, recommendations from the study are most relevant for individuals in these types of programs.

- Study participants were only representative of a subset of the workplace and workforce development programs served by the Workforce Learning Systems and Work Keys system, and may not be representative of the universe of programs served by these two systems.

- This study focused on reading and mathematics assessments. Both the Workforce Learning Systems and Work Keys system have additional system components to assist human resource development efforts, but linkages for these other system components were not included in this study.

- The study participants were adults. Therefore, the results may not be readily applicable to programs serving younger individuals.

Research Results

The empirical study answered both of the research questions, finding that:

- The Workforce Learning Systems and Work Keys reading and mathematics assessments are *sufficiently similar* to warrant linking the two systems, and

- The Workforce Learning Systems and Work Keys reading and mathematics assessments are *sufficiently different* to provide more information when linked than when either system is used on its own.

The relationships between the CASAS Workforce Learning Systems and the ACT Work Keys system do offer the anticipated extension ladder effect. The CASAS Workforce Learning Systems scales extends below and differentiates more levels below the ACT Work Keys system level 3 in both skill areas. The ACT Work Keys system differentiates more levels at the upper end and extends above the CASAS Workforce Learning Systems scales. Therefore, the CASAS Workforce Learning Systems and ACT Work Keys system can be articulated, with their effectiveness for an individual dependent on the level at which that person enters an instructional program and on the intended use of the score.

Although the relationship between the score scales for each skill area is strong enough to permit scores on one test to be *estimated* from scores on the other, scores on one test *may not be directly substituted* for scores on the other for the same skill area.

Interpreting the Results

By articulating the Workforce Learning Systems and Work Keys system, it is possible to assess individuals upon entering an instructional program at whatever level they are currently functioning, and to provide assessment to support their eventual transitions into the workplace as they reach the skill levels required by employers.

The next four tables (Tables 4 to 7) may be used to estimate what level a person with Workforce Learning Systems scores might achieve on the Work Keys assessments, and what level a person with Work Keys scores might achieve on the Workforce Learning Systems assessments. They have been designed to help practitioners *use the study results* to provide learners, employees, and others who have scores on one assessment with information about how they might score on the other.

There are two tables for the reading assessments (Tables 4 and 6): one based on the CASAS Workforce Learning Systems scale (Table 4) and the other based on the ACT Work Keys scale (Table 6). There are also two similar tables for the mathematics assessments (Tables 5 and 7). All of the tables are to be read in the same way. Start by looking in the leftmost column for the score level that matches the score the person already has. Then, read across that row to find the chances in 100 (the probability) that the individual would have each of the different level scores on the other test for the same skill area.

Table 4, for example, shows that if an individual has an ACT Work Keys reading score of level 4, he or she has 2 chances in 100 of having a CASAS Workforce Learning Systems reading level of B, 44 chances in 100 of having a CASAS Workforce Learning Systems reading level of C, 47 chances in 100 of having a CASAS Workforce Learning Systems reading level of D, and 7 chances in 100 of having a CASAS Workforce Learning Systems level of E. That is, if this person were to take the Workforce Learning Systems reading test, he or she would probably score at the C or D level.

These tables make it clear that a level on either test is related to more than one level on the other. The information presented in these four tables, along with other information about examinees, can help educators, training specialists, and counselors make better instructional decisions.

Table 4

Expected CASAS Workforce Learning Systems Reading Levels as Indicated by ACT Work Keys Scores

ACT Work Keys Reading for Information Score	Chances in 100 of each CASAS Workforce Learning Systems Reading Level				
	Level A	Level B	Level C	Level D	Level E
Below 3 (*N*=53)	4	43	53		
Level 3 (*N*=55)		16	66	14	4
Level 4 (*N*=128)		2	44	47	7
Level 5 (*N*=58)		2	12	41	45
Level 6 (*N*=26)		4	8	8	81
Level 7 (*N*=11)				9	91

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

Table 5

Expected CASAS Workforce Learning Systems Mathematics Levels as Indicated by ACT Work Keys Scores

ACT Work Keys Applied Mathematics Score	Chances in 100 of each CASAS Workforce Learning Systems Mathematics Level				
	Level A	Level B	Level C	Level D	Level E
Below 3 (N=51)	10	76	14		
Level 3 (N=105)		55	43	1	1
Level 4 (N=91)		26	57	16	
Level 5 (N=35)		9	46	43	3
Level 6 (N=13)			8	54	38
Level 7 (N=6)				17	83

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

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Table 6

Expected ACT Work Keys Reading Levels as Indicated by CASAS Workforce Learning Systems Scores

CASAS Workforce Learning Systems Reading Score	Chances in 100 of each ACT Work Keys Reading for Information Level					
	Below 3	Level 3	Level 4	Level 5	Level 6	Level 7
Level A (*N*=2)	100					
Level B (*N*=36)	64	25	6	3	3	
Level C (*N*=121)	22	28	44	5	2	
Level D (*N*=39)		8	63	25	2	1
Level E (*N*=12)		3	13	38	31	15

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

Table 7

Expected ACT Work Keys Mathematics Levels as Indicated by CASAS Workforce Learning Systems Scores

CASAS Workforce Learning Systems Mathematics Score	Chances in 100 of each ACT Work Keys Applied Mathematics Level					
	Below 3	Level 3	Level 4	Level 5	Level 6	Level 7
Level A (*N*=5)	100					
Level B (*N*=124)	32	47	19	3		
Level C (*N*=121)	6	37	43	13	1	
Level D (*N*=39)		3	38	38	18	3
Level E (*N*=12)		8		8	42	42

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

Conclusions

- Both CASAS' Workforce Learning Systems and ACT's Work Keys system measure basic and more advanced skills needed for effective participation in the workforce and workplace.
- There is enough *commonality* in both the content and range of skills covered by the Workforce Learning Systems and Work Keys system to determine a meaningful connection between the two.
- There is enough *difference* in the range of skills covered by the Workforce Learning Systems and Work Keys system to warrant joining the two together in a basic skills continuum. This continuum provides more useful information over a greater range of skill levels than is available from either system alone.

- The Workforce Learning Systems covers skills that are more basic, and provides more information on the skills of individuals functioning at the *lower* end of the skills continuum.

- The Work Keys system covers skills that are more advanced, and provides more information on the skills of individuals functioning at the *higher* end of the skills continuum.

- The Workforce Learning Systems and Work Keys system complement each other, and can be used together to provide a smooth, progressive, and complete skills continuum.

- A statistical relationship exists between the CASAS Workforce Learning Systems and the ACT Work Keys system scales that can be used to *estimate* scores on one assessment from scores on the other.

- It is not appropriate to *substitute* scores on one assessment with those from the other.

Recommendations

- Educators, trainers, and human resource managers can use the Workforce Learning Systems and the Work Keys system *in tandem* to help individuals progress along a broad skills continuum, from their current skill levels to the skill levels required for successful participation in the workforce.

- Educators, trainers, and human resource managers can use the *Workforce Learning Systems assessments* with individuals whose skills are on the *lower* end of the skills continuum.

- Educators, trainers, and human resource managers can use the *Work Keys system assessments* with individuals whose skills are on the *higher* end of the skills continuum.

- Educators, trainers, and human resource managers can use the assessments of either the Workforce Learning Systems, the Work Keys system, or the two systems together with individuals whose skills are in the *mid range* of the skills continuum.

Potential Uses

The information on linking CASAS' Workforce Learning Systems and ACT's Work Keys has myriad uses for education and training providers. Some of these uses are identified below. More detailed information on these applications is contained in the full report.

For Those Using the Workforce Learning Systems

- Individuals who have already been tested with a Workforce Learning Systems assessment can use the tables in this publication to *estimate* how they would perform on a Work Keys assessment, and determine whether it would be worthwhile for them to take that assessment now. This would be valuable in cases where the individuals assessed with Workforce Learning Systems needed to meet a Work Keys standard, perhaps for a new job or a promotion.

- Individuals in CASAS-based education and training programs can use Work Keys Occupational Profiles, along with the tables in this publication, to estimate the CASAS scale scores they would need in order to meet the reading and mathematics requirements for specific occupations. Work Keys has developed profiles on a number of occupations by combining the results of occupational job analyses conducted in specific companies.

- Individuals can also use the results from this study, along with their Workforce Learning Systems scores, to gauge their progress toward meeting a Work Keys level.

- Individuals scoring in CASAS level E can gain further information on their skills and abilities by taking the Work Keys assessments. Moving from the Workforce Learning Systems to the Work Keys system enables these individuals to take advantage of the upward extension offered by the Work Keys system.

For Those Using Work Keys

- Individuals who have already been tested with a Work Keys assessment can use the tables in this publication to *estimate* how they would perform on a Workforce Learning Systems assessment, and determine whether it would be worthwhile for them to take that assessment now. This would be valuable in cases where the individuals assessed with Work Keys needed to meet a Workforce Learning Systems standard.

- Individuals in Work Keys-based education and training programs can use the CASAS Materials Guide, along with the tables in this publication, to select appropriate curriculum and instruction materials. The CASAS guide correlates over 1,000 commercially available instructional textbooks, videos, and software programs to more than 300 competency statements (or learning objectives).

- Individuals in Work Keys-based education and training programs can use CASAS research to estimate how long it would take them to move from one Work Keys level to the next.

- Individuals scoring below Work Keys level 3 can gain further information on their skills and abilities by taking the Workforce Learning Systems assessments. Moving from the Work Keys system to the Workforce Learning Systems enables these individuals to take advantage of the downward extension offered by the Workforce Learning Systems.

For Those Using neither the Workforce Learning Systems nor Work Keys

Selecting the most appropriate assessment to use with an individual should depend first on the purpose of the assessment. If, for example, the purpose is to compare the individual's score with a standard based on a Work Keys job profile, a Work Keys assessment is required. If, on the other hand, the purpose of the assessment is to provide the individual with appropriate instruction based on the CASAS Instructional Materials Guide, a Workforce Learning Systems assessment is required.

- Individuals likely to score below level 3 on the Work Keys assessments would be better served by the Workforce Learning Systems.

- Individuals likely to score at CASAS level E on the Workforce Learning Systems assessments would be better served by the Work Keys system.

For Those Seeking a Comprehensive Assessment System

The results of this study can benefit the assessment efforts of education and training programs at state and local levels. Together, the Workforce Learning Systems and Work Keys system assess the broad range of skills programs are likely to encounter. By using these two systems in tandem, states and localities can operate a comprehensive, articulated assessment system, rather than a *potpourri* of unrelated assessment tests.

- The results of this study are particularly useful for states and localities establishing one-stop systems. One-stop facilities are designed to serve *any* individuals needing employment and training services, from welfare recipients to dislocated workers. With such a broad mandate, one-stop centers need a comprehensive assessment system appropriate to all comers.

- The results of this study will also help states and localities meet their responsibilities under the new Welfare Reform mandate. Many welfare recipients will begin their education and training programs at skill levels most appropriately measured by the Workforce Learning Systems.[3] Many welfare recipients will then need to continue their education and training programs (before or after employment) until they reach skill levels best measured by the Work Keys system.

[3] Three-fourths of the United States' welfare recipients scored at or below level 2 on the National Adult Literacy Survey (NALS) test (*Barton and Jenkins, 1995, p. 3*).

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FOREWORD

May 30, 1997

Equipping today's workforce with competitive skills offers greater income security for the workforce and increased productivity for businesses.

Two organizations, ACT and CASAS, have each developed a system to identify the skills learners and employees need to thrive in the workforce. These systems of skill assessment are related directly through job analysis activities enabling learners and employers to identify employees who will succeed on the job as well as identify the additional skill training needed to be productive on the job. These two systems will help employers, employees, learners and trainers to maintain our nation's competitive workforce edge among nations.

Specifically, ACT and CASAS have researched how their systems can aid learners and employers by extending the ladder of preparation and assessment for youth and adult learners to the levels of skills today's employers need. Use of these two systems in tandem can begin training at the skill level of the individual and continue that training to the levels businesses require. ACT and CASAS have demonstrated how this ladder of skill development can be extended to benefit all.

This report emphasizes the benefits of such a private venture as initiated by these two businesses: a venture offering national economic growth by maintaining the competitive edge in the global marketplace.

Roberts T. Jones
President and CEO
National Alliance of Business

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Preface

One of the most critical elements in helping individuals prepare for the educational and workforce challenges of the twenty-first century is a comprehensive assessment system that provides accurate and reliable information about individuals' employability skills. The CASAS/Work Keys Study was undertaken by the Comprehensive Adult Student Assessment System (CASAS) and ACT as a joint project to link their respective workforce assessment systems. The goal was to form a comprehensive assessment system that can be utilized by a variety of agencies, educational institutions, business and industry, and workforce development centers.

This study brings together two large-scale assessment systems, each of which provides important information about people: the assessment component of CASAS' Workforce Learning Systems which is designed to measure basic literacy skills within an employment context, and the assessment component of the Work Keys system which is designed to assess employability skills. By analyzing data from CASAS' Workforce Learning Systems and Work Keys reading and mathematics assessments, CASAS and ACT researchers were able to investigate the relationship and provide linkages between the two assessment systems. Given the results of this study it is now possible to offer individuals, educators, and business and industry a comprehensive assessment system designed to support individuals' skill development from the most basic to highly advanced levels.

This study addresses the assessment needs of many target audiences including:

- business and industry trainers and developers of training systems,
- members of the American Society for Training and Development (ASTD),
- secondary and postsecondary educators,
- governmental agencies and organizations involved in workforce development and preparation,
- policy and decision makers,
- other individuals and agencies involved in assessment and training endeavors.

This landmark study answers an urgent need for linking two nationally recognized assessment systems: CASAS' Workforce Learning Systems and ACT's Work Keys. This study benefits the greater society by providing a comprehensive assessment system that will help individuals gain the necessary skills to function effectively in the twenty-first century.

John Hartwig
CASAS/Work Keys
Project Director

Patricia Rickard
CASAS
Executive Director

Joyce R. McLarty
Director, Work Keys
Development

Joel D. West
Former Executive Director
ACT Center for
Education and Work

Acknowledgments

This study was completed through the guidance, interest, and assistance of many individuals who devoted their time, energy, expertise, enthusiasm, motivation, dedication, and vision in all areas of the project. The administrative team expresses appreciation to the individuals and groups who participated and assisted in making the study a successful reality.

A special thank you is extended to the personnel in the participating states and data collection sites who assisted during the data collection phase of the project. Without their willingness to participate, the study could have not been completed. *(See Appendix A for a complete listing of participating states and data collection sites.)*

Recognition is paid to **Andrew Hartman**, Executive Director of the National Institute for Literacy (NIFL), for providing funding to reimburse the data collection site administrators and proctors. The adult students who participated in the study each received a pocket calculator or pocket dictionary (*see Appendix B*).

The CASAS team was led by **Patricia Rickard** who set direction and provided advice and guidance along the way. **Terri Bergman** served as lead CASAS writer, with **Jane Egüez** and **Linda Taylor** providing valuable input. **Jane Egüez** and **Zoë Abrahams** managed the data collection. **Randy Ilas** performed the data analysis.

The Work Keys team was led initially by **Joel West**, who established the direction and guided the ACT Center for Education and Work (ACEW) staff, assisted by **Joy McLarty** who took responsibility for the team after West's retirement. **Diane Walters** and the ACT Operations staff worked with the data collection. **Tim Vansickle** of ACEW conducted the data analysis. **Jacque McClure** and **Phil Bailey**, also of ACEW, provided advice and assistance throughout the project. **Michael Rasmusson** of the ACT Publications Department provided the cover design for the reports.

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CASAS/Work Keys
Project Director

Patricia Rickard
CASAS
Executive Director

Joyce R. McLarty
Director, Work Keys
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Chapter One

Overview

Life-long learning is the watchword of the day. All across America people are increasingly aware that staying productive and competitive in the workplace requires staying current, and staying current requires continuous investments in skill development. No longer is this the concern only of those in the education and training sectors, employers and employees are reaching this conclusion as well.

Extending the Ladder focuses on the nation's investments in skill development. It shows how assessment systems from two of our country's premier testing organizations — the Comprehensive Adult Student Assessment System (CASAS) and ACT — can be linked to guide individuals' education and training as they progress from basic literacy skills to the level of advanced skills required to succeed in an increasingly complex economy.

The Comprehensive Adult Student Assessment System and ACT have long histories in the design and delivery of skill assessments. More recently, CASAS, with its Workforce Learning Systems and ACT, with its Work Keys system, have developed assessment instruments specifically focused on the skills employers indicate employees must have. The Workforce Learning Systems and Work Keys also include tools to assess the job skills needed in the workplace, so that focused training programs can be developed to bridge the gap between what individuals know and can do, and what they need to be able to do to succeed on the job.

CASAS' Workforce Learning Systems provides high quality, valuable assessments of the *basic skills* needed in the workplace. ACT's Work Keys system provides high quality, valuable assessments of *more advanced skills* required for employees to be productive in the workplace. Given these different levels, these two assessment systems complement each other to form a comprehensive assessment system.

How, precisely, are the two systems related? At what range of points do the Workforce Learning Systems and Work Keys system assessments overlap? How, finally, can a *ladder be extended* to help individuals beginning their skill development at levels tested by the Workforce Learning Systems progress on a continuum up to skill levels employees need as assessed by Work Keys?

Target Audience

Extending the Ladder answers these questions. It can help a broad range of educators and trainers better meet the needs of their customers — both learners and employers. By extending a ladder linking Workforce Learning Systems and Work Keys skill levels, the study described in this publication provides educators and trainers with a continuous assessment system which not only *assesses* individuals' current abilities, but also *provides a focus* for their further education and training.

Extending the Ladder is valuable reading for individuals throughout the education and training communities. It has value for secondary educators, postsecondary educators, adult educators, employment and training providers, and both education and corporate-based workplace trainers. As more and more states begin to build comprehensive education and training systems and establish one-stop career centers, *Extending the Ladder* can play a unifying role, tying together all of a state's workforce development programs — and the training needs of the diverse array of individuals they serve.

Value of Assessment

Today, workforce development is a central economic and social issue. Considerable attention is focused on improving employees' productivity. Clearly, this is to the benefit of business and industry since it impacts companies' bottom lines. Employees, too, have an interest in their own productivity. The more productive they are, the more employable, and the greater their earnings and income security.

Productive employees are well trained and appropriately skilled. The emphasis here is on *well* trained and *appropriately* skilled. Training needs to be carefully focused, planned, and executed to bring employees' skills to the levels required on their jobs. This type of workforce development can best be accomplished with the aid of a "comprehensive assessment system."

A comprehensive assessment system is comprised of four main parts:

- **Job Analysis** or **Needs Assessment** - Determining the skills needed in the current and future workplace and in specific jobs.
- **Individual Assessment** - Determining the skill levels of current and potential employees.
- **Contextual Training** - Providing effective training to bridge the gap between the level of individuals' skills and the level required on the job.
- **Ongoing Assessment** and **Certification** - Monitoring progress and determining whether skills have been mastered.

The keystone to this system is *assessment:* assessment of the competencies required on the job; assessment of the competencies individuals possess; and re-assessment to monitor progress and document skill attainment.

It is important to note the *contextual* nature of the comprehensive assessment system. Job analyses, by definition, assess skill requirements within the context of the workplace and specific jobs. Individual assessments, administered before, during, or at the end of a training program, also measure people's skills within an employability context.

A workplace context is also critical to the training component. Training must focus on applications, and provide clear linkages between what is being taught and the work that individuals will perform. This is not to say that training should be focused solely on narrow job tasks. Training must provide learners with generalizable skills that are required across multiple work settings, while clearly relating the skills being taught to real and relevant work applications.

Benefit to Individuals

A comprehensive assessment system facilitates individuals' entry into and advancement within the job market by providing assistance in three key areas:

- Information,
- Training, and
- Certification.

A comprehensive assessment system provides individuals with timely and relevant information about the skills needed for the jobs and careers they would like to pursue. It also provides them with information about their own skill levels, and the education and training they need to acquire to be competitive.

A comprehensive assessment system identifies appropriate training for individuals. It also facilitates development of a "portfolio" of transferable skills they can take from one employer to another as job opportunities shift.

A high school diploma does not communicate whether individuals have the skills required to be productive and successful in the labor market. Class content varies from school to school or even from class to class within a school, and letter grades are incomparable. A comprehensive assessment system provides individuals with "competency-based certifications" that clearly spell out the skills they possess. Such certifications provide employers with information about the skills *they themselves* have determined are valuable and relevant, through their participation in job analyses. As a result, employers are more likely to find the certifications relevant and valuable, and the certifications will help individuals in their job application efforts.

Benefit to Employers

The key value of a comprehensive assessment system to employers is the access it gives them to individuals with the levels of skills the employers need in their employees – both current and potential. By first determining job skill needs, and then training to them, this system meets companies' human resource demands. By communicating their job skill needs to educators, employers improve their own applicant pools.

This match-up of employee skills to employer needs is supported through employers' participation in job analyses. Initial job analysis or needs assessment research determines what competencies companies require, and enables companies to be clear about the skills and training needed for success on the job.

With a comprehensive assessment system, training can be customized and packaged to meet the needs of a specific business or industry. Learning can take place within an appropriate context, while still being generalizable to multiple work situations and transferable to different work environments.

A comprehensive needs assessment system can help business and industry gain perspective on the *total* learning needs of their employees, from basic skills through advanced training. There are classic examples of companies having invested heavily in *technical training*, only to discover that the majority of their employees did not have the necessary *basic skills* to profit from that training. Effective training is built on a base of high quality job analyses and individual assessments.

Benefit to Educators

A comprehensive assessment system is of great benefit to educators, too. For educators to be successful, they need to provide individuals with skills valued by employers. When students know they are learning skills demanded in the job market, their motivation increases and they choose to become active learners.

A comprehensive assessment system creates a common language that enables employers and educators to communicate about skill needs. With the information educators gain from employers, they can design curriculum and instruction that is both effective (provides individuals with the right skills), and efficient (focuses on the skills that make a difference in the workplace).

Value of Skill Development

Assessment is key to skill development, and skill development is key to prosperity: individuals', companies', and the nation's. A common language of skills provides the basis for assessment and for building skills: it defines skill needs and shapes skill instruction, supplying a road map for skill development. Without a common language supported by assessment, training can lack focus and direction. With such assessment, it can be both effective and efficient.

Today, while traditional credentials (diplomas and certifications) might provide *initial access* to jobs, it is the skills people posses that enable them to work effectively and efficiently *on* the job. Applied skills, at appropriate levels of proficiency, are what individuals need. While success depends on job-specific information and knowledge, as well as generic skills, job specifics are constantly expanding and changing. Generic skills help people stay current; they are the keys to long term success, advancement, and income security.

The value of skill development to individuals is well documented. The National Adult Literacy Survey (NALS) found that individuals demonstrating higher levels of literacy were more likely to be employed, work more weeks in a year, and earn higher wages than individuals demonstrating lower levels of proficiency (*Kirsch, et al., 1993*). For years, the U.S. Department of Labor has

published statistics showing that those with education beyond high school earn significantly more than those with a high school diploma, while those who leave school *before* receiving a diploma earn significantly less (*U.S. Department of Labor, 1995*[1]).

The value of skill development to companies has been less well documented. There have been individual companies that have calculated a return on their own training investments and regional and sectorial studies estimating the return on investments in training; but until recently, there was no major *national* study. However, in 1995, the National Center on the Educational Quality of the Workforce at the University of Pennsylvania was able to quantify training's benefit to companies, demonstrating that a 10 percent increase in the average education of all workers within an establishment (or about a year of schooling) yielded an 8.6 percent increase in productivity for all industries (*National Center on the Education Quality of the Workforce, 1995*).

As individuals and companies benefit from skill development, so too does the nation. Maintenance of our global competitive edge is contingent upon competent workforce skill levels.

Research Plan

Both CASAS and ACT are committed to skill development. The two organizations share a common goal of helping education and training providers improve the skills of both those entering and those currently employed in the workforce. Assessments from both organizations are designed to determine individuals' current skill levels, and then, more importantly, guide them as they work to advance those levels.

To better achieve their common goal, CASAS and ACT established a plan to study the relationship between two of their assessment systems — CASAS' Workforce Learning Systems and ACT's Work Keys — to determine how the systems could be linked to support individuals as they move up the employability skills ladder. Instead of looking at how one assessment system might compete with or substitute for the other, the two organizations have cooperated to better determine how linkages between the two systems might establish a comprehensive continuum of assessment to better support skills development.

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[1] This publication contains data for the years 1980, 1985, 1990, and 1994. Every year, data is collected through the Current Population Survey by the Bureau of the Census, U.S. Department of Commerce, and analyzed by the Bureau of Labor Statistics, U.S. Department of Labor. The positive relationship between education and earnings has been a consistent finding of these studies.

Project Themes

The project team formulated the following theme statements which served as the guiding principles for the research project:

- This research project was a joint cooperative venture between two private organizations, CASAS and ACT, to develop a comprehensive assessment model for the nation's workforce. This cooperative venture is one of an increasing number of workplace skill development initiatives envisioned by and carried out by mainstream private organizations.

- Each organization has developed its own respective assessment system with unique expertise inherent in each system.

- The effective use of these two systems, functioning in tandem, can identify training needs at the skill level of the individual and continue that training to the requisite levels mandated by business and industry for occupations requiring higher skill levels.

- Both systems use job analysis services and assessment of individual skills to enable learners and employers to identify employees who will succeed on the job as well as identify the additional training needed to be productive on the job. Using this information, a trainer is better able to guide individuals as they prepare for and maintain successful performance in today's competitive workforce.

- The results of this study can be utilized to offer individuals, educators, and business and industry a comprehensive assessment system designed to support individuals' skill development from the most basic to highly advanced levels.

- The utility of the Extension Ladder Assessment Model is adaptable to a wide variety of workforce and career development environments.

- Assessment of basic and advanced workplace skills can be viewed as a continuous and progressive process.

- There is dignity and personal identification associated with one's occupation at all levels of the work-related skills continuum. All occupations require mastery of varying levels of skill attainment ranging from basic communication and literacy skills through advanced technical skills.

Project Assumptions

The research for *Extending the Ladder* was based on five key assumptions:

- Assessment of basic and advanced workplace skills can be viewed as a continuous and progressive process.

- CASAS' Workforce Learning Systems provides high quality, valuable assessments of the basic skills needed in the workplace.

- ACT's Work Keys system provides high quality, valuable assessments of more advanced skills required for employees to be productive in the workplace.

- CASAS' Workforce Learning Systems and ACT's Work Keys reading assessments measure similar content and have some overlap in the range of skill levels they measure. The Workforce Learning Systems and Work Keys mathematics assessments also measure similar content and have some overlap in the range of skill levels they measure.

- There is a complementary link between the Workforce Learning Systems and Work Keys system.

Goals and Objectives

The overarching goal of the *Extending the Ladder* project was to provide educators, trainers, employers and employees with a common language and articulated assessments for communicating about basic and advanced workplace skills and the standards for measuring them. Specific objectives included:

- Determining the degree to which CASAS' Workforce Learning Systems and ACT's Work Keys assessments can be linked to provide a continuous, progressive assessment system from basic through advanced workplace skills.

- Providing guidance on appropriate assessments as learners make the transition through skill levels on the Workforce Learning Systems or Work Keys assessment systems.

- Providing information to support establishing comprehensive assessment systems in a variety of workforce settings (e.g. secondary and postsecondary education programs, business and industry, workforce development centers, or social service agencies).

Research Questions

Given these assumptions, the project team for *Extending the Ladder* developed two foci for this study as formulated in the following research questions:

- Are the Workforce Learning Systems and Work Keys assessments in reading and mathematics sufficiently highly correlated in the range of skill levels covered to permit meaningful articulation of the two scales?

- Are the Workforce Learning Systems and Work Keys assessments in reading and mathematics different enough in the range of skill levels covered so that articulation of the two scales will extend beyond the total range of skills covered in the individual assessments?

Project Phases

To meet its goals and objectives, the *Extending the Ladder* team identified five, slightly overlapping phases for its research effort:

Phase	Task	Time Frame
I	Project Definition	04/01/96 - 08/30/96
II	Data Collection	09/04/96 - 10/30/96
III	Data Analysis	11/01/96 - 03/01/97
IV	Report Writing	01/01/97 - 08/30/97
V	Dissemination	09/17/97 - 12/30/97

Chapter Two

Methodology and Instrumentation

Both CASAS' Workforce Learning Systems and ACT's Work Keys system are comprehensive assessment systems. Both include job analyses and individual assessments in an employability context, and both facilitate contextual training.

CASAS' Workforce Learning Systems was developed to fill a critical void in the employability skills measurement and instruction of youth and adult students enrolled in employment preparation and workplace training programs. The Workforce Learning Systems provides a structure in which learners' strengths and weaknesses are assessed in relation to the basic skills necessary to obtain, retain, and advance in a job. This assessment is supported by a workplace analysis that determines the skills needed in the workplace, and a curriculum management system that links the skills needed in the workplace to instruction.

ACT's Work Keys system was developed to remedy crucial basic skill deficiencies in the nation's current and future workforce. Work Keys helps employers identify skill levels required by their jobs, select qualified applicants, and communicate skill requirements to future employees and their instructors. Work Keys job profiling supports employers' use of Work Keys scores for job selection by addressing Equal Employment Opportunity Commission (EEOC) content validation requirements. By linking required skill levels to hiring decisions, employers make their "admission standards" public. Work Keys also calculates *occupational* profiles — summaries of job profiles across different companies — which help guide students and educators to develop those skills and skill levels.

CASAS and the Workforce Learning Systems

CASAS began developing its Workforce Learning Systems in the mid 1980s to promote *workplace learning* and *workforce preparation.* The tools included in the Workforce Learning Systems are designed for an employment context, targeting both those currently employed and those pursuing employment (the Employability Competency System series). Workforce Learning Systems is designed to assess and to meet the training needs of today's diverse workforce, including native and non-native English speakers. Over 12 years of continuing research and development have ensured the system is relevant to today's job and skill requirements.[2]

[2] For more information on CASAS, the Workforce Learning Systems, and the Employability Competency System, contact CASAS, 8910 Clairemont Mesa Boulevard, San Diego, CA 92123-1104; telephone (619)292-2900 or (800)255-1036; fax (619)292-2910; or visit the CASAS home page on the Internet at http://www.casas.org.

Workforce Learning Systems tools address all four components of a comprehensive assessment system:

- A **Workplace Analysis** that identifies the basic skills and skill levels required by employees at a work site for continuous quality improvement.

- **Workplace Appraisals** that determine individuals' actual skill levels, and provide pertinent information required for establishing training standards and goals.

- An **Instructional Materials Guide** that helps trainers locate the most appropriate curricula for developing and delivering work site training. The guide correlates over 1,000 commercially available instructional textbooks, videos, and software programs to more than 300 competency statements (or learning objectives).

- **Standardized**, including **Performance-Based, Assessments** that measure learners' progress and certify their skill attainment, evaluate program results, and provide a reporting system.

The Employability Competency System (ECS), a part of the Workforce Learning Systems, focuses on workplace skills, but places a heavier emphasis on skills for *accessing* the labor market than do other parts of the Workforce Learning Systems. The ECS includes appraisals and diagnostic tests to assess individuals' employability competencies and shape appropriate training strategies. ECS appraisals predict individuals' general reading and mathematics functional levels, while the more targeted Reading and Mathematics for Employability pre-tests provide the diagnostic information needed to design and deliver appropriate training. ECS pre-employment and work maturity checklists provide standardized forms for rating individuals' career awareness and ability to interview and fill out job applications. A reporting system provides useful information to learners and program staff.

CASAS' Workforce Learning Systems stresses the importance of job analyses for effectively targeting workforce and workplace training efforts. The first component, the Workplace Analysis process, analyzes the reading, mathematics, writing, communication, and critical thinking skills and skill levels required for specific jobs. This basic skills blueprint ensures that training efforts meet the specific skill demands of specific jobs in American businesses. Employment-related skills are assessed through multiple measures, including standardized assessment tools, as well as such customized curriculum assessment strategies as logs, projects, and portfolios. The ECS pre-employment and work maturity checklists are just some of the standardized, performance-based assessments that CASAS has developed for the Workforce Learning Systems and ECS.

CASAS systems have been validated by the Program Effectiveness Panel of the U.S. Department of Education, which determined that learners in educational programs that have adopted key CASAS elements 1) demonstrate significant learning gains, 2) demonstrate increased hours of participation, and 3) achieve increased goal attainment compared to programs that have not adopted the key elements.

The CASAS National Consortium, comprising 17 states, has participated in the research and development of the Workforce Learning Systems over a 12 year period. Consortium members from these states represent state employment and workplace training programs, community college systems, state adult education agencies, high schools, literacy programs, community-based organizations, and correctional institutions.

Consortium members identify key priority needs for development, help field test and evaluate assessment and curriculum management components and processes, assist in providing the training needed for implementation, and share successful strategies and outcomes in their states. The breadth of the National Consortium ensures that the system and its components are relevant for diverse populations and workforce programs across the United States.

Development of the Workforce Learning Systems

CASAS' Workforce Learning Systems is specialized, and focused on workplace related competencies, and skills linked to appropriate curriculum, assessment, and evaluation systems. In developing the Workforce Learning Systems, CASAS surveyed business and industry representatives and employment and training professionals, and reviewed existing company and employment and training program curricula to determine the competencies required for success in the workplace. All Workforce Learning Systems tools — workplace analyses, appraisals, materials guides, and assessments — were then focused on these competencies.

The competencies are highly correlated with the SCANS competencies and foundation skills. These competencies and skills, defined by the U.S. Department of Labor's Secretary's Commission on Achieving Necessary Skills (SCANS), represent the nation's best thinking about the skills and abilities all individuals need in order to function successfully in the modern workplace and society.[3]

CASAS multiple choice assessments are created from an Item Bank of more than 5,000 statistically reliable and externally validated test questions. These, in turn, are linked to specific competency statements within nine content areas: basic communication, consumer economics, community resources, health, employment, government and law, computation, learning to learn, and independent living. The assessments developed for the Workforce Learning Systems measure the high priority competencies relevant to the workforce.

Workforce Learning Systems is used by companies implementing workplace learning programs, Job Training Partnership Act (JTPA) and welfare employment training programs, vocational and occupational education providers, community colleges, regional occupational programs and centers, workplace literacy providers, unified school districts, community-based organizations, and correctional institutions.

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[3] See CASAS Competencies 1996 (San Diego, CA: CASAS, 1996) for a correlation of CASAS competencies to SCANS competencies, and a correlation of SCANS competencies to CASAS competencies.

Employability Competency System Appraisal

CASAS chose to use the ECS reading and mathematics appraisals, form 130, for this study because it assesses individuals' strengths and weaknesses *in relation to the basic skills necessary to obtain and to retain a job.* Each appraisal takes 25 minutes to administer and measures participants' performance on reading and mathematics applications encountered in the workplace. The ECS form 130 appraisal was chosen over other Workforce Learning Systems appraisals because it accurately assesses up to a higher level of skills, and is likely to provide a more significant link with ACT's Work Keys assessments.

Reading. The reading section of the ECS appraisal tests participants' reading skills *within an employability context.* The appraisal includes items requiring participants to read and answer questions about 1) a job ad in a newspaper, 2) an employee's personnel record, 3) a job application letter, 4) a medical history report, 5) an employee handbook, 6) a job description, or 7) newspaper articles covering, for example, a labor contract, the importance of a high school diploma, or occupational staffing patterns. It also includes items requiring participants to interpret and answer questions about graphs, which might, for example, chart work activity in a business over time.

Mathematics. The mathematics section of the ECS appraisal also tests mathematics skills *within an employability context.* It includes items requiring participants to interpret and make calculations from 1) pay stubs, 2) pie charts of budget figures, 3) time cards, or 4) bar graphs of poverty levels, as well as word problems requiring participants to compute real heights from a scale drawing, a perimeter, the average number of customers visiting a store daily, the cost of carpeting a living room, or the number of different outfits that can be put together from a specified wardrobe. This appraisal also includes basic addition, subtraction, multiplication, and division problems.

Basic Skills Levels. CASAS assessment instruments measure a wide range of skill levels, providing accurate assessments for individuals with special learning needs on up to those with high school completion level skills. CASAS assessments are scored from below 150 to above 250, and classified along a five-level scale ranging from Levels A through E. Clear and easily understood "competency descriptors" provide information detailing the skills of individuals scoring within each of the five levels. The scaled scores, score levels, and competency descriptors are contained in Table 2.1. (*See Appendix C for sample assessment items in reading and mathematics for CASAS Levels A and E.*)

Table 2.1
CASAS Basic Skills Levels

CASAS Level	Competency Descriptors
E	**Advanced Adult Secondary** With some assistance, persons at this level are able to interpret technical information, more complex manuals, and material safety data sheets (MSDS). Can comprehend some college textbooks and apprenticeship manuals.
D	**Adult Secondary** Can read and follow multi-step directions; read and interpret common legal forms and manuals; use math in business, such as calculating discounts; create and use tables and graphs; communicate personal opinion in written form; write an accident or incident report. Can integrate information from multiple texts, charts, and graphs as well as evaluate and organize information. Can perform tasks that involve oral and written instructions in both familiar and unfamiliar situations.
C	**Advanced Basic Skills** Can handle most routine reading, writing, and computational tasks related to their life roles. Can interpret routine charts, graphs, and labels; read and interpret a simple handbook for employees; interpret a payroll stub; complete an order form and do calculations; compute tips; reconcile a bank statement; fill out medical information forms and job applications. Can follow multi-step diagrams and written instructions; maintain a family budget; and write a simple accident or incident report. Can handle jobs and job training situations that involve following oral and simple written instructions and diagrams. Persons at the upper end of this score range are able to begin GED preparation.
B	**Intermediate Basic Skills** Can handle basic reading, writing, and computational tasks related to their life roles. Can read and interpret simplified and some authentic materials on familiar topics. Can interpret simple charts, graphs, and labels; interpret a basic payroll stub; follow basic written instructions and diagrams. Can complete a simple order form and do calculations; fill out basic medical information forms and basic job applications; follow basic oral and written instructions and diagrams. Can handle jobs and/or job training that involve following basic oral or written instructions and diagrams if they can be clarified orally. **Beginning Basic Skills** Can fill out simple forms requiring basic personal information, write a simple list or telephone message, calculate a single simple operation when numbers are given, and make simple change. Can read and interpret simple sentences on familiar topics. Can read and interpret simple directions, signs, maps, and simple menus. Can handle entry level jobs that involve some simple written communication.
A	**Pre-Literacy** Very limited ability to read or write. Persons at the upper end of this score range can read and write numbers and letters and simple words and phrases related to immediate needs. Can provide very basic personal identification in written form such as on job applications. Can handle routine entry level jobs that require only basic written communication.

CASAS, 1997

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ACT and Work Keys

A comprehensive program for assessing and developing workplace skills, the Work Keys system was developed by ACT in the early 1990s in partnership with the charter states of Illinois, Iowa, Michigan, Ohio, Oregon, and Tennessee, the Community College System of California, numerous other educational organizations, and a cross-section of American business. The Work Keys system is a coordinated set of programs and services designed to help individuals, employers, and educators work together to improve the skills of the workforce.[4]

Work Keys skill scales provide a common language for describing the levels of foundational skills required by jobs as well as those demonstrated by individuals. Comparison of the skill levels required by a job (the job profile) with the skill levels demonstrated by an individual supports identification of any skill deficiencies, which can then be addressed through education and training. Applicants who meet the job profile requirements possess the foundational skills needed to perform competently on that job. These skills, together with any needed job-specific skills, make them prime candidates for employment.

Work Keys consists of four components:

- **Assessments** that measure learners' workplace skills,
- A **job profiling** system that determines the skills required for competent performance in specific jobs,
- **Instructional support** that helps instructors teach necessary skills, and
- A **research and reporting** system that provides timely and useful information to Work Keys participants.

Work Keys currently supports the skill areas of Applied Mathematics, Listening, Writing, Reading for Information, Applied Technology, Locating Information, Teamwork, and Observation. For each skill area, a common skill scale provides the links between job profiling, assessments, and instructional support.

Development of the Work Keys System and Skill Levels

The comparability of Work Keys assessment scores and job profile levels is made possible by a highly professional and specialized development process that is unique to the ACT Work Keys system. Development of each Work Keys assessment begins with the development of the skill scale. A panel of educators and employers meet with ACT staff to carefully circumscribe the skill itself and to describe a series of levels within that skill.

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[4] For more information on ACT and the Work Keys system, contact ACT, 2201 North Dodge Street, P.O. Box 168, Iowa City, Iowa 52243; telephone (800)WORKKEY; fax (319)337-1725; or visit the ACT home page on the Internet at http://www.act.org.

The lowest level of the skill is identified as the simplest level for which a business would be interested in administering an assessment for hiring purposes. Typically that level is well above "none" of the skill, and for that reason, for multiple choice tests, that level has generally been given the name "Level 3."

The highest level is identified as the most complex level at which an employee might be expected to function without specialized training. Once the top and bottom levels are described, the panel determines about how many levels can be distinguished from the bottom to the top of the scale, and these levels are named by counting up from the lowest (Level 3, Level 4, Level 5, etc.). Note that since Listening and Writing scores are based on scoring the examinee's actual response, scores for those skill areas go from 0 (no usable information written) to 5 (perfect response).

Once the skill scale has been described, ACT staff develop the job analysis (job profiling) and assessment components of the system. The Work Keys system job analysis (job profiling) component consists of a training process to guide qualified individuals to learn the Work Keys job analysis system, an authorization system to permit these trained individuals to develop job profiles for employers and other clients, and a software system to support them as they perform this function.

Job profiling identifies the Work Keys skills and skill levels needed to competently perform a specific job in a particular company. A set of materials that comprise both benchmark definitions and examples for each level of skill are developed for each skill area. These are developed and tried out by Work Keys staff industrial/organizational psychologists to ensure that incumbent workers are able to understand and provide sound information about the skill level required by their jobs. Once staff are able to profile the job successfully for the skill area, the materials are incorporated into the training program for Work Keys' authorized job profilers, enabling them to also profile jobs for that skill area.

Job profiles are designed to be used by companies to select new employees or identify training needs among current employees, as well as to convey expectations for employee skill levels to educators. Job profiles are used by individual businesses to address EEOC content validation standards and are proprietary to the company that developed them. ACT does not release individually identifiable job profiles to others.

However, in order to meet the information needs of educators more fully, ACT has developed occupational profiles. Occupational profiles are constructed by averaging the data for job profiles for jobs in the Work Keys data base that have the same associated Dictionary of Occupational Titles (DOT) code or are part of some other grouping of interest. These occupational profiles are made available for guidance and instructional uses since they provide key information about the nature and levels of skills actually required. Because they are not associated with a specific job in a specific company, occupational profiles cannot be used as part of selection criteria.

Work Keys Assessments

Work Keys used the Reading for Information and Applied Mathematics assessments for this study since, of the Work Keys skill areas, these tests are the most closely aligned to the two CASAS ECS appraisals used in this study. Each assessment requires 40 minutes administration time and measures the examinee on a scale from 3 to 7. These Work Keys assessments do not include the interpretations of graphs and charts that are included in the ECS reading and mathematics assessments since these skills are covered in the separate Work Keys Locating Information skill area.

Reading for Information. The Reading for Information assessment measures an examinee's skill in reading and understanding work-related instructions and policies. The reading passages and questions in the assessment are based on the actual demands of the workplace. Passages take the form of memos, bulletins, notices, letters, policy manuals, and governmental regulations. Such materials differ from the expository and narrative texts used in most reading instruction, which are usually written to facilitate reading. Workplace communication is not necessarily well written or targeted to the appropriate audience. Because the Reading for Information assessment uses workplace texts, the assessment is more reflective of actual workplace conditions. Examinees are given 40 minutes to answer 30 multiple-choice questions.

The reading materials and related multiple-choice questions comprise five levels of complexity, with Level 3 being the least complex and Level 7 the most complex. Although Level 3 is the least complex, the questions require a level of reading skill well above simple decoding. The levels build on each other, each incorporating the skills assessed at the preceding levels. Skill levels are described in Table 2.2.

Work Keys job profiles indicate that Reading for Information is a relevant skill for virtually every job, and that the level of skill needed is within the Work Keys scale (i.e., at least level 3 and not above level 7). Based on 613 jobs profiled, 99.2% were found to be within the scale, with .8% below the scale and none above.

Table 2.2
Work Keys Reading for Information

Work Keys Level	Level Description
3	Questions at Level 3 measure the examiner's skill in reading short, uncomplicated passages which use elementary vocabulary. The reading materials include basic company policies, procedures, and announcements. All of the information needed to answer the questions is stated clearly in the reading materials, and the questions focus on the main points of the passages. At this level, the wording of the questions and answers is similar or identical to the wording used in the reading materials. Questions at Level 3 require the examinee to •identify uncomplicated key concepts and simple details; •recognize the proper placement of a step in a sequence of events, or the proper time to perform a task; •identify the meaning of a word that is defined within the passage; •identify the meaning of a simple word that is not defined within the passage; and •recognize the application of instructions given in the passage to situations that are also described in the passage.
4	At Level 4, the reading passages are slightly more complex than those at Level 3. They contain more detail and describe procedures which involve a greater number of steps. Some passages describe policies and procedures with a variety of factors which must be considered in order to decide on appropriate behavior. The vocabulary, while elementary, includes words that are more difficult than those at Level 3. For example, the word "immediately" may be used at this level, whereas at Level 3 the phrase "right away" would be used. At this level, the questions and answers are paraphrased from the passage. In addition to the skills tested at the preceding level, questions at Level 4 require the examinee to •identify important details that are less obvious than those in Level 3; •recognize the application of more complex instructions, some of which involve several steps, to describe situations; and •recognize cause-effect relationships.
5	Passages at Level 5 are more detailed, more complicated, and cover broader topics than those at Level 4. Words and phrases may be specialized (e.g., jargon and technical terms), and some words may have multiple meanings. Questions at this level typically call for applying information given in the passage to a situation that is not specifically described in the passage. All of the information needed to answer the questions is stated clearly in the passages, but the examinee may need to take several considerations into account in order to choose the correct responses. In addition to the skills tested at the preceding levels, questions at Level 5 require the examinee to •identify the paraphrased definition of a technical term or jargon that is defined in the passage; •recognize the application of technical terms or jargon to stated situations; •recognize the definition of an acronym that is defined in the passage; •identify the appropriate definition of a word with multiple meanings; •recognize the application of instructions from the passage to new situations that are similar to those described in the reading materials; and •recognize the application of more complex instructions to described situations, including conditionals and procedures with multiple steps.
6	Passages at Level 6 are significantly more difficult than those at the previous level. The presentation of the information is more complex; passages may include excerpts from regulatory and legal documents. The procedures and concepts described are more elaborate. Advanced vocabulary, jargon, and technical terms are used. Most information needed to answer the questions correctly is not clearly stated in the passages. The questions at this level require examinees to generalize beyond the stated situation, to recognize implied details, and to recognize the probable rationale behind policies and procedures. In addition to the skills tested at the preceding levels, questions at Level 6 require the examinee to •recognize the application of jargon or technical terms to new situations; •recognize the application of complex instructions to new situations; •recognize, from context, the less common meaning of a word with multiple meanings; •generalize from the passage to situations not described in the passage; •identify implied details; •explain the rationale behind a procedure, policy, or communication; and •generalize from the passage to a somewhat similar situation.
7	The questions at Level 7 are similar to those at Level 6 in that they require the examinee to generalize beyond the stated situation, to recognize implied details, and to recognize the probable rationale behind policies and procedures. However, the passages are more difficult; the density of information is higher; the concepts are more complex, and the vocabulary is more difficult. Passages include jargon and technical terms whose definitions must be derived from context. In addition to the skills tested at the proceeding levels, questions at Level 7 require the examinee to •recognize the definitions of difficult, uncommon jargon or technical terms, based on the context of the reading materials; and •figure out the general principles underlying described situations and apply them to situations neither described in nor completely similar to those in the passage.

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Applied Mathematics The Applied Mathematics assessment measures the examinee's skill in applying mathematical reasoning to work-related problems. The test questions require the examinee to set up and solve the types of problems and do the types of calculations that actually occur in the workplace. This test is designed to be taken with a calculator. As on the job, the calculator serves as a tool for problem solving. A formula sheet that includes, but is not limited to, all formulas required for the assessment is provided. Examinees are given 40 minutes to solve 30 multiple-choice problems.

This assessment contains questions at five levels of complexity, with Level 3 being the least complex and Level 7 being the most complex. The levels build on each other, each incorporating the skills assessed at the preceding levels. The skill levels for the assessment are described in Table 2.3.

The Applied Mathematics skill scale and assessment are focused on problem-solving and mathematical reasoning skills, rather than on "higher level" mathematical procedures. Thus, there is no formal algebra, geometry, trigonometry, or calculus on the assessment, although knowledge of these procedures, and especially of algebra, can be instrumental in allowing an examinee to think through and solve the problems.

The job profiles indicate that Applied Mathematics is a relevant skill for most jobs, and that the level of skill needed is within the Work Keys scale (i.e., at least level 3 and not above level 7). Based on 604 jobs profiled, 96.5% were found to be within the scale, with 3.3% below the scale and .2% above. It is important to recall that Applied Mathematics, like the other Work Keys skill scales, is not intended to measure skills that require job-specific training. Thus, many jobs that do require use of higher level mathematical procedures (such as trigonometry for engineering technicians) were determined in profiling to require *both* a level within the Work Keys Applied Mathematics scale (in the case of engineering technicians, typically a 6 or 7) *and* specialized training in mathematics. (*See Appendix C for sample assessment items in reading and mathematics for Work Keys Levels 3 and 7.*)

Table 2.3
Work Keys Applied Mathematics

Work Keys Level	Level Description
3	Problems at Level 3 measure the examinee's skill in performing basic mathematical operations (addition, subtraction, multiplication, and division) and conversions from one form to another, using whole numbers, fractions, decimals, or percentages. Solutions to problems at Level 3 are straightforward, involving a single type of mathematical operation. For example, the examinee might be required to add several numbers or to calculate the correct change in a simple financial transaction. Problems at this level translate easily from a verbal setup to a mathematical equation. All the information needed to solve the problems is provided in logical order and no unrelated information is included. Problem setups may include units of measurement. However, with the exception of dollars and cents, these units function solely as labels and are not involved in actual calculations.
4	Problems at Level 4 measure the examinee's skill in performing one or two mathematical operations, such as addition, subtraction, or multiplication, on several positive or negative numbers. (Division of negative numbers is not covered until Level 5.) Problems may require adding commonly known fractions, decimals, or percentages (e.g., 1/2, .75, 25%), or adding three fractions that share a common denominator. At this level, the examinee is also required to calculate averages, simple ratios, proportions, and rates, using whole numbers and decimals. Problems at this level require the examinee to reorder verbal information before performing calculations. The examinee must read the entire problem carefully to determine which operation(s) to perform and in what order. For some problems, examinees must read a simple chart or graph to obtain the information needed to solve the problem.
5	Problems at Level 5 require the examinee to look up and calculate single-step conversions within English or non-English systems of measurement (e.g., converting from ounces to pounds or from centimeters to meters) or between systems of measurement (e.g., converting from centimeters to inches). These problems also require calculations using mixed units (e.g., hours and minutes). Problems at this level contain several steps of logic and calculation. The examinee must determine what information, calculations, and unit conversions are needed to find a solution. For example, the examinee might be asked to calculate perimeters and areas of basic shapes, to calculate percent discounts or markups, or to complete a balance sheet or order form.
6	Problems at Level 6 measure the examinee's skill in using negative numbers, fractions, ratios, percentages, and mixed numbers in calculations. For example, the examinee might be required to calculate multiple rates, to find areas of rectangles or circles and volumes of rectangular solids, or to solve problems that compare production rates and pricing schemes. The examinee might need to transpose a formula before calculating or to look up and use two formulas in conversions within a system of measurement. Level 6 problems may also involve identifying and correcting errors in calculations. Problems at Level 6 may require considerable translation from verbal form to mathematical expression. They generally require considerable set-up and involve multiple-step calculations or conversions.
7	Problems at Level 7 require multiple steps of logic and calculation. For example, the examinee may be required to convert between systems of measurement that involve fractions, mixed numbers, decimals, or percentages; to calculate multiple areas and volumes of spheres, cylinders, and cones; to set up and manipulate complex ratios and proportions; or to determine the better economic value of several alternatives. Problems may involve more than one unknown, nonlinear functions, and application of basic statistical concepts (e.g., error of measurement). The examinee may be required to locate errors in multiple-step calculations. At this level, problem content or format may be unusual, and the information presented may be incomplete or implicit, requiring the examinee to derive the information needed to solve the problem from the setup.

ACT, 1997

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Extension Ladder: Workforce Learning Systems/Work Keys

Both CASAS' Workforce Learning Systems and ACT's Work Keys system are highly effective, workforce focused assessment systems. Neither, however, is targeted broadly enough to assess the extensive range of skill levels existent in America's workforce. Separately, Workforce Learning Systems and the Work Keys system provide valuable information about individuals' basic skill levels. Together, they provide an "assessment continuum" that can be likened to an *extension ladder*, with the Workforce Learning Systems assessments forming the lower ladder rungs, and the Work Keys system assessments extending beyond the Workforce Learning Systems' highest skill levels and forming the higher ladder rungs (*see Figure 2.1*).

There is a critical need for implementing a workforce focused assessment system that addresses this *broad continuum* of skill levels, from the "first rung of the ladder" (basic skills), up to the "top rungs of the ladder" (more advanced skills). The National Adult Literacy Survey, released by the U.S. Department of Education in 1993, categorized our nation's literacy skills into five levels.[5] This study found that approximately half of the adult population is functioning at the two lowest levels (levels 1 and 2), nearly one-third at the middle level (level 3), and only about one-sixth at the highest two levels (levels 4 and 5).

Some individuals functioning at the *lowest* NALS literacy level (level 1) are able to perform simple, routine tasks, like totaling an entry on a deposit slip, locating the time or place of a meeting on a form, and identifying a piece of specific information in a brief news article. Others at this level cannot even perform these tasks. Individuals functioning at the *second* lowest NALS literacy level (level 2) may be able to calculate the total cost of a purchase or determine the difference in price between two items, locate a particular intersection on a street map, and enter background information on a simple form. Those functioning at the *middle* NALS literacy level (level 3) are able to integrate information and determine appropriate arithmetic operations.

Individuals functioning at the *second* highest NALS literacy levels (level 4) are able to synthesize information from lengthy or complex passages, make inferences based on text and documents, and perform sequential arithmetic operations using numbers found in different types of displays. Those functioning at the *highest* NALS level (level 5) are able to contrast complex information found in written materials, or make high level inferences or search for information in dense text; use specialized knowledge and search through complex displays for particular pieces of information; and determine the features of arithmetic problems either by examining text or by using background knowledge, and then perform the multiple arithmetic operations required. This broad range of skills, represented by the five NALS levels, must be matched by an equally broad system of skill assessments.

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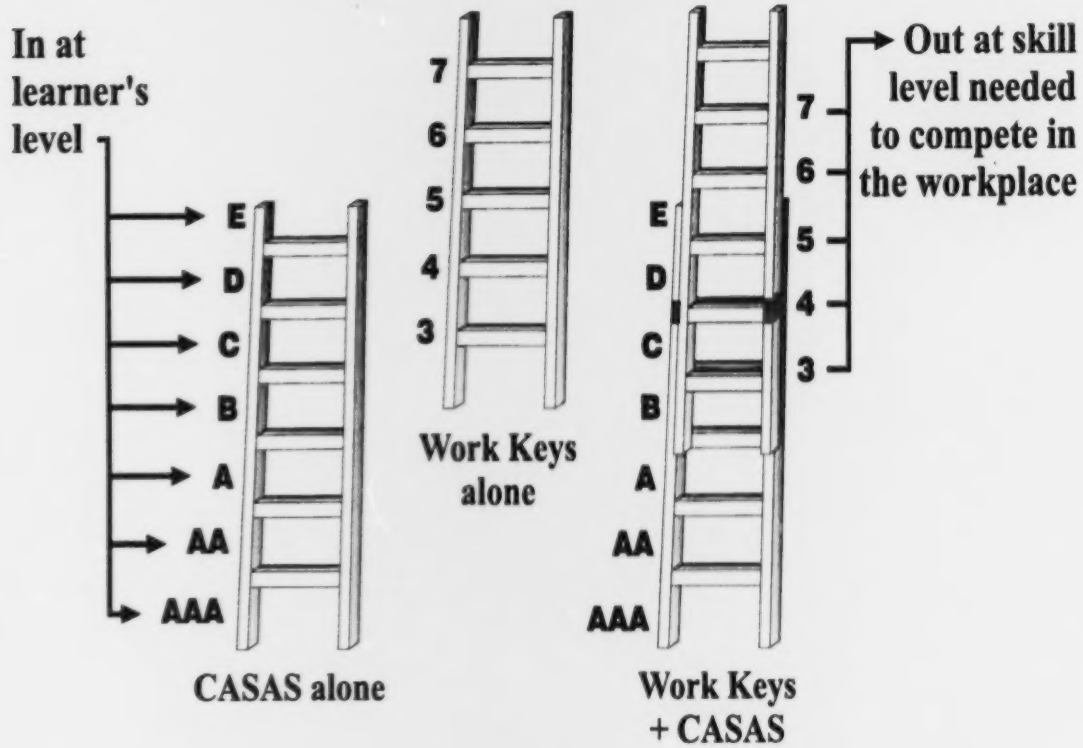
[5] See Kirsch, Jungeblut, Jenkins, and Kolstad, *Adult Literacy in America: A First Look at the Results of the National Adult Literacy Survey* (Washington, DC: National Center for Education Statistics, 1993) for more information on NALS and the NALS levels.

Figure 2.1

An Extension Ladder Approach to Lifelong Learning: CASAS/Work Keys



The *Extending the Ladder* project began with an assumption that CASAS' Workforce Learning Systems, which uses assessments and instructional materials tailored to the current skill levels of learners, will help individuals at the lower levels of the skills continuum begin to acquire the skills needed for a particular job or occupation. Individuals at the upper levels of the skills continuum need higher level assessments. The *Extending the Ladder* project began with the assumption that Work Keys system assessments would be better at measuring the more advanced skills these individuals would have.

The *Extending the Ladder* project assumed that individuals in the middle of the skills continuum might be well served by *both* assessment systems. Just as an extension ladder needs a solid, overlapping section to ensure its stability and structural integrity, the Workforce Learning Systems and Work Keys system would benefit from an overlap in skills assessment, in the middle of the continuum, to provide a smooth transition from one assessment system to the next. A strong correlation over some middle skill range would provide a useful transition from lower level basic skills to higher level, more advanced skills.

This study was designed to determine whether the Workforce Learning Systems and Work Keys system assessments can be linked to create an assessment scale *extension ladder* that can support learners throughout the skills acquisition process. If the two systems can be linked in this way, they will help learners begin their studies at their current skill levels, and continue their studies until they have acquired the skills needed for the jobs they are seeking. An added benefit is the fact that workforce and worksite training programs will clearly see a solid link joining the Workforce Learning Systems and Work Keys system.

Methodology

The *Extending the Ladder* project team *first* conducted a content/cognitive review to verify the study's assumptions, and *then* conducted an empirical study to address the study's two research questions.

Content/Cognitive Review

The project's content/cognitive review verified the project's five assumptions concerning:

- The continuity of assessing basic and advanced workplace skills,
- The Workforce Learning Systems' ability to assess basic skills,
- The Work Keys system's ability to assess more advanced skills,
- The two systems' content similarity and overlap in the range of skill levels covered, and
- The existence of a complementary link between the two assessment systems.

For the content/cognitive review, CASAS and ACT staff exchanged assessments and related material for the four assessments under study: CASAS' Employability Competency System (ECS) reading and mathematics appraisals, and Work Keys' Reading for Information and Applied Mathematics assessments. Staff from each organization then reviewed all test items, noted the content and skills measured, identified the extent of the content/skills match between the CASAS and Work Keys instruments, shared their findings, and discussed the relationship between the two systems.

In order for the Workforce Learning Systems and Work Keys system assessments to be linked, they need to measure similar content (reading and mathematics), and they need to contain some items measuring skills at comparable levels of difficulty (the area of overlap on the extension ladder). The content/cognitive review found considerable similarity in the content measured by the two systems, with both systems relating assessment items to "real-life" workforce tasks, as opposed to academic tasks.

The ECS mathematics appraisal and Work Keys Applied Mathematics assessment measure very similar skill sets, while over 70 percent of the ECS reading appraisal measures skills similar to those found in the Work Keys Reading for Information assessment. The most significant content difference between the two assessment systems is that the ECS reading and mathematics appraisals test skills in interpreting graphs, while Work Keys tests these skills in a third assessment instrument, Locating Information, which was not part of this study.

The content/cognitive review also discovered a number of structural differences between the two assessment systems. They contain a different number of items within each test (25 each for the ECS appraisals, 30 each for the Work Keys system assessments), they provide a different number of responses for each test item from which test takers can choose (four for ECS appraisals, five for Work Keys system assessments), and they require a different length of time for completion (25 minutes for each ECS appraisal, 40 minutes for each Work Keys system assessment). The range of difficulty covered by the two systems' assessments also differ, but the review found enough of an overlap to meet the conditions for establishing an empirical link.

Empirical Study

Once the assumptions were verified, the project team designed and conducted an empirical study to address the project's two research questions on:

- The *degree of correlation* in the range of skill levels covered by the two systems, and
- The *extent* of the range of skill levels covered by the two systems in combination.

For the empirical study, adult learners were asked to take both ECS and Work Keys reading assessments, and/or both ECS and Work Keys mathematics assessments. Comparisons were then made, for each individual, between scores on the paired tests in order to determine the linkage between the ECS and Work Keys system assessments. Results from those taking both pairs of tests were used to check the internal consistency of the ECS and Work Keys system instruments.

Site Selection. Data were collected from 27 sites across eight states (*See Appendix D for data collection information by state and site*). States were selected for participation from across the country. Participating sites were selected from locations with workforce literacy programs, to ensure that the individuals participating in the assessments would represent the adult population in workforce literacy programs.

Neither states nor sites were selected randomly. While many states volunteered to participate in the project, the funding and scope limitations of the study circumscribed the project boundaries. Project sites included the variety of settings where adult workforce learning programs are provided, ranging from community colleges to correctional institutions, and from adult education to worksite training programs.

Participant Sampling Procedures. Sites were asked to randomly select 20 to 30 learners to participate in the study. Efforts were made to ensure that the participants were representative of the total population (by sex, ethnicity, age, etc.), which required some sites to use a stratified random sampling procedure. To encourage participation, individuals were awarded dictionaries for taking the reading assessments and calculators for taking the mathematics assessments. The number of examinees with usable scores at each site ranged from two to 31 (*see Appendix D*).

Instrumentation. In order to establish an empirical link between the two systems, the assessments had to be administered to the same examinees, and the examinees had to have skills at levels appropriate to the assessments. Individuals participating in the reading study took both the ECS form 130 reading appraisal and the Work Keys Reading for Information assessment. Those participating in the mathematics study took both the ECS form 130 mathematics appraisal and the Work Keys Applied Mathematics assessment.

The two ECS appraisals took 25 minutes each, and the two Work Keys system assessments required 40 minutes each as indicated in Table 2.4.

Table 2.4

Time Required for Administering the Assessments

READING		MATHEMATICS	
Assessment Instrument	**Minutes**	**Assessment Instrument**	**Minutes**
CASAS Employability Competency System Form 130 Reading Appraisal	25	CASAS Employability Competency System Form 130 Mathematics Appraisal	25
ACT Work Keys Reading for Information	40	ACT Work Keys Applied Mathematics	40
TOTAL	65	TOTAL	65

CASAS and ACT, 1997

Instrument Administration. CASAS and ACT were responsible for mailing their assessment materials and instructions to state coordinators, who distributed the materials to the collection sites. A state coordinators' orientation conference call was held September 4, 1996, to train the coordinators on test administration and sampling procedures. Once the assessments had been administered, data collection sites mailed both the ECS and Work Keys system assessments to the state coordinators, who forwarded the ECS assessments to CASAS and the Work Keys assessments to ACT. CASAS and ACT were responsible for scoring the individual assessments.

Data Collection. A total of 551 people took one or both of the Workforce Learning Systems ECS appraisals, and 558 took one or both of the Work Keys system assessments. The test results of some of these individuals were removed from the study. This occurred for one of two reasons:

- Examinees did not answer enough questions on the test to produce a reliable score, or
- There was no corresponding test from the other testing organization, for the same individual, in the same subject to create a match.

With these tests removed, the study had scores from 494 individuals (a reduction of approximately 10 percent from the number of initial test takers): 193 with only reading test scores, 163 with only mathematics test scores, and 138 with both reading and mathematics test scores as indicated in Table 2.5.

Table 2.5
Number of Examinees

Assessment Instrument	Reading Only	Mathematics Only	Reading and Mathematics	Total
Workforce Learning Systems	172	168	211	551
Work Keys	211	191	156	558
Matched Workforce Learning Systems and Work Keys	193*	163	138	494

*The number of matched Workforce Learning Systems and Work Keys reading scores exceeds the number of Workforce Learning Systems reading scores because some of the Work Keys reading scores were matched with Workforce Learning Systems reading scores from individuals who also took the Workforce Learning Systems mathematics assessment (those in column four).

CASAS and ACT, 1997

Delimitations. The sampling method used for this study imposed some limitations on the use of the study results.

- The study results are useful in implementing a comprehensive assessment system including both the Workforce Learning Systems and Work Keys system. However, they are only relevant for the Workforce Learning System's ECS form 130 reading and mathematics appraisals and the Work Keys' Reading for Information and Applied Mathematics assessments, and not for any other Workforce Learning Systems or Work Keys assessments.

- Because the participants in this study came from workplace and workforce development programs, recommendations from the study are most relevant for individuals in these types of programs.

- Study participants were only representative of a subset of the workplace and workforce development programs served by the Workforce Learning Systems and Work Keys system, and may not be representative of the universe of programs served by these two systems.

- This study focused on reading and mathematics assessments. Both the Workforce Learning Systems and Work Keys system have additional system components to assist human resource development efforts, but linkages for these other system components were not included in this study.

- The study participants were adults. Therefore, the results may not be readily applicable to programs serving younger individuals.

Chapter Three

Research Results

This chapter reports the results of the empirical study. It includes information about the examinees who participated and an analysis of their scores. The analysis was designed to address each of the research questions and, if the results indicated that linking could appropriately be accomplished, to actually link the CASAS Workforce Learning Systems and ACT Work Keys score scales.

Collection of data for the empirical study went as planned. Individual adult students were asked to take the CASAS Workforce Learning Systems and the ACT Work Keys assessments for both reading and mathematics. Their answer documents were sent to the appropriate organization, CASAS or ACT, for scoring. Once the data records had been prepared for the individual examinees on the tests they took, these records were matched so that both the Workforce Learning Systems and the Work Keys scores appeared in each examinee's record.

Since some individuals took only the reading assessments, some took only the mathematics assessments, and some took both the reading and the mathematics assessments, the total number of participants in the study is larger than the number of individuals who took any pair of assessments. There were some examinees who marked very few items and received scores at or below the chance level. In order to ensure that the results of the study were as accurate as possible, the records for these examinees were excluded from the analysis. Although this reduced the total number of examinees included in the data analyzed for each skill area, it was determined to be preferable to including data that might reduce the reliability or validity of the results.

Characteristics of the Study Participants

Sample sizes for the study depend on whether the original, unmatched numbers or the final matched sample are being considered. While a total of 558 individuals participated in the study, not all of them took all the tests. Based on the *unmatched* file, 383 individuals took the Workforce Learning Systems reading assessment and 367 individuals took the Work Keys reading assessment; 379 took the Workforce Learning Systems mathematics assessment and 347 took the Work Keys mathematics assessment.

The number of cases was reduced by the matching process, since some records from Workforce Learning Systems and Work Keys did not match based on name, ID number, and other information. Exclusion of a few cases where individuals had marked very few items on a test reduced the sample a little further. Table 3.1 presents the sample sizes for the final *matched* file, which included a total of 494 examinees. All of the remaining parts of the analysis were performed on this group of 494 examinees.

Table 3.1

Sample Sizes for the Workforce Learning Systems/ Work Keys Study Matched Cases

	Reading		Mathematics	
	Workforce Learning Systems	Work Keys	Workforce Learning Systems	Work Keys
Reading				
Workforce Learning Systems	349	331	192	156
Work Keys	331	334	177	140
Mathematics				
Workforce Learning Systems	192	177	338	301
Work Keys	156	140	301	301

CASAS and ACT, 1997

Note that the diagonal from top left to bottom right in Table 3.1 gives the remaining sample sizes for each of the individual tests while the other cells give sample sizes for pairs of tests. Some examinees took all four tests to provide data relating the two skill areas within a testing program. This allowed each program to compare that information with similar data from their typical examinees (*see Appendix E*).

Table 3.2 provides demographic information about the study participants tested. Many study participants did not report all of their demographic data. About three-quarters of the study participants reported their gender; of these, about two-thirds were female and one-third male. Almost 80 percent reported information for computing age, and over 65 percent of these individuals were between the ages of 18 and 45.

More than half of the study participants reporting an ethnic group were white. There were smaller percentages of Hispanic and black students and only a few students with Asian, Pacific Island, or Native American or Alaskan backgrounds. Most study participants chose to report their native language, and for about three-quarters of them it was English. About ten percent (51 students) identified Spanish as their native language. Eleven additional languages were marked by 53 students, and an additional 19 students marked "other" as their native language.

Table 3.2
Demographic Information for Study Participants

Category	Frequency	Percent	Valid Percent
		Gender	
Female	236	47.7	62.4
Male	142	28.7	37.6
Not Reported	117	23.6	
		Age	
< 18	46	9.3	11.5
18 - 25	125	25.3	31.3
26 - 35	116	23.4	29.1
36 - 45	81	16.4	20.3
46 - 55	25	5.1	6.3
> 55	6	1.2	1.5
Not Reported	96	19.4	
		Racial or Ethnic Group	
Asian or Pacific Islander	22	4.4	6.3
Black	47	9.5	13.4
Hispanic	57	11.5	16.3
Native American or Alaskan	8	1.6	2.3
White	195	39.4	55.7
Other	21	4.2	6.0
Not Reported	145	29.3	
		Native Language	
Arabic	5	1.0	1.0
Cambodian	2	0.4	0.4
Chinese	10	2.0	2.0
English	360	72.7	74.5
Farsi	3	0.6	0.6
Japanese	2	0.4	0.4
Korean	1	0.2	0.2
Polish	2	0.4	0.4
Portuguese	1	0.2	0.2
Russian	2	0.4	0.4
Spanish	51	10.3	10.6
Tagalog	2	0.4	0.4
Vietnamese	23	4.6	4.8
Other	19	3.8	3.9
Not Reported	12	2.4	
		Highest Diploma or Degree Earned	
None	279	56.4	58.6
GED	25	5.1	5.3
High School	106	21.4	22.3
Technical Degree	18	3.6	3.8
Associate Degree	10	2.0	2.1
Other	38	7.7	8.0
Not Reported	19	3.8	

CASAS and ACT, 1997

The majority of study participants had not attained any educational diploma or degree. Over one quarter had attained a GED or high school diploma, and slightly more than five percent had attained a technical or associate degree.

Relationships Between Level Scores for the Two Assessments

Research question one states: Are the Workforce Learning systems and Work Keys assessments in reading and mathematics sufficiently highly correlated in the range of skill levels covered to permit meaningful articulation of the two scales?

This question focused on whether there was a sufficient empirical relationship between the different measures (Workforce Learning Systems and Work Keys) within a single skill area to support linking the scales. The absence of this relationship would mean that the measures are focused on different skills and that linking them would not be an appropriate approach to take.

As described previously, the CASAS Workforce Learning Systems scale has five levels, with level A being the lowest and E the highest, and the ACT Work Keys tests have six levels with "below level 3" being the lowest, followed by levels 3 to 7, with level 7 being the highest. Most of the examinees who took each test scored toward the middle values of the score scale for that test. This is important because it means that the tests were at appropriate levels of difficulty for most examinees, which helped to ensure that the resulting scores would be valid. Had this not been the case, the data would not have provided the information necessary to support the linking.

Tables 3.3 and 3.4 show the numbers of examinees receiving different combinations of CASAS Workforce Learning Systems and ACT Work Keys level scores for reading and mathematics skill areas, respectively. Correlation coefficients were computed between the two measures in each skill area. The resulting correlations were .71 for reading and .70 for mathematics. This means that the relationship between the tests accounted for about 49 percent of the variance in scores, a sufficiently strong relationship to support linking the scales.

Table 3.3
Number of Individuals at CASAS Workforce Learning Systems and ACT Work Keys Reading Levels

ACT Work Keys	CASAS Workforce Learning Systems					
	Level A	Level B	Level C	Level D	Level E	Total
Below 3	2	23	28			53
Level 3		9	36	8	2	55
Level 4		2	57	60	9	128
Level 5		1	7	24	26	58
Level 6		1	2	2	21	26
Level 7				1	10	11
Totals	2	36	130	95	68	331

CASAS and ACT, 1997

Table 3.4

Number of Individuals at CASAS Workforce Learning Systems and ACT Work Keys Mathematics Levels

ACT Work Keys	CASAS Workforce Learning Systems					
	Level A	Level B	Level C	Level D	Level E	Totals
Below 3	5	39	7			51
Level 3		58	45	1	1	105
Level 4		24	52	15		91
Level 5		3	16	15	1	35
Level 6			1	7	5	13
Level 7				1	5	6
Total	5	124	121	39	12	301

CASAS and ACT, 1997

Although there is an empirical relationship that is strong enough to support the linking, Tables 3.3 and 3.4 also show that there is not a one-to-one correspondence between the scores on Workforce Learning Systems and Work Keys assessments. This suggests that the two tests in each skill area are not measuring exactly the same thing with the same level of reliability. For this reason, *scores on one assessment cannot be directly substituted for scores on the other.* However, the relationship between the score scales is strong enough to permit scores on one to be *estimated* from scores on the other.

Differentiation of the Two Scales

Research question two states: Are the Workforce Learning Systems and Work Keys assessments in reading and mathematics different enough in the range of skill levels covered so that articulation of the two scales will extend beyond the range of skills covered in the individual assessments?

When two scales are empirically related, it is possible to predict scores on one from scores on the other, and this is useful in some cases. To find the answer to research question 2, that is, to determine the amount that the ladder could be extended by linking the CASAS Workforce Learning Systems and ACT Work Keys score scales, it was necessary to begin by putting the Workforce Learning Systems and Work Keys reading assessments onto a common scale, and both mathematics assessments onto a common scale.

Because *estimation* in both directions (from Workforce Learning Systems to Work Keys and from Work Keys to Workforce Learning Systems) was required, this process was completed twice, once by starting with the scale for the Workforce Learning Systems assessment and determining how the scale for the corresponding Work Keys assessment related to the CASAS Workforce Learning Systems scale; and once by starting with the ACT Work Keys scale and determining how the scale for the corresponding Workforce Learning Systems assessment related to it.

In order to achieve the greatest accuracy in linking, the metrics with the greatest definition (number of score points) were used. For Workforce Learning Systems these were scaled scores, and for Work Keys they were scaled item response theta scores. Because the relationships between each of these scores and the corresponding level scale for each assessment were known, it was then possible to see how the CASAS Workforce Learning Systems levels relate to the ACT Work Keys levels.

The relationships, when starting with the CASAS Workforce Learning Systems scales and determining how the ACT Work Keys scales relate to them, are shown in figure 3.1. The top bar in each section of the graphic shows the CASAS Workforce Learning Systems scale, and the bottom bar shows where the ACT Work Keys levels can, on average, be linked to that scale.

To calculate this relationship, for each Workforce Learning Systems score point at which any examinee scored, the Work Keys theta score for every examinee with that Workforce Learning Systems score was found. The average of this subset of scaled scores was then calculated. For example, if there were 35 examinees with a CASAS Workforce Learning Systems scaled score of 226, the ACT Work Keys theta score for each of these examinees was identified, and the average of these 35 scores was calculated.

This averaging process was repeated for every CASAS Workforce Learning Systems scaled score achieved by any examinee who took both tests in the study. This created a correspondence between each Workforce Learning Systems score on the CASAS scale and the average Work Keys theta score for every Workforce Learning Systems score attained by at least one study participant.

Mapping the Work Keys level scale onto the CASAS scale was then achieved by matching the Work Keys theta scores at the end points of each Work Keys level with their corresponding Workforce Learning Systems scores on the CASAS scale. For example, the Work Keys theta score at the low end of Work Keys level 3 corresponded with a score of 229 on the CASAS reading scale. Thus, the low end of Work Keys level 3 was aligned with 229 on the CASAS reading scale in figure 3.1.

Because this relationship is based on an *average* score for examinees scoring at 229 on the CASAS reading scale, an examinee who scored a 229 on the CASAS reading scale would be expected to have about a 50/50 chance of scoring at Work Keys level 3 in reading. That is, this relationship is accurate for group averages, but does not provide unambiguous information about individual examinees' scores.

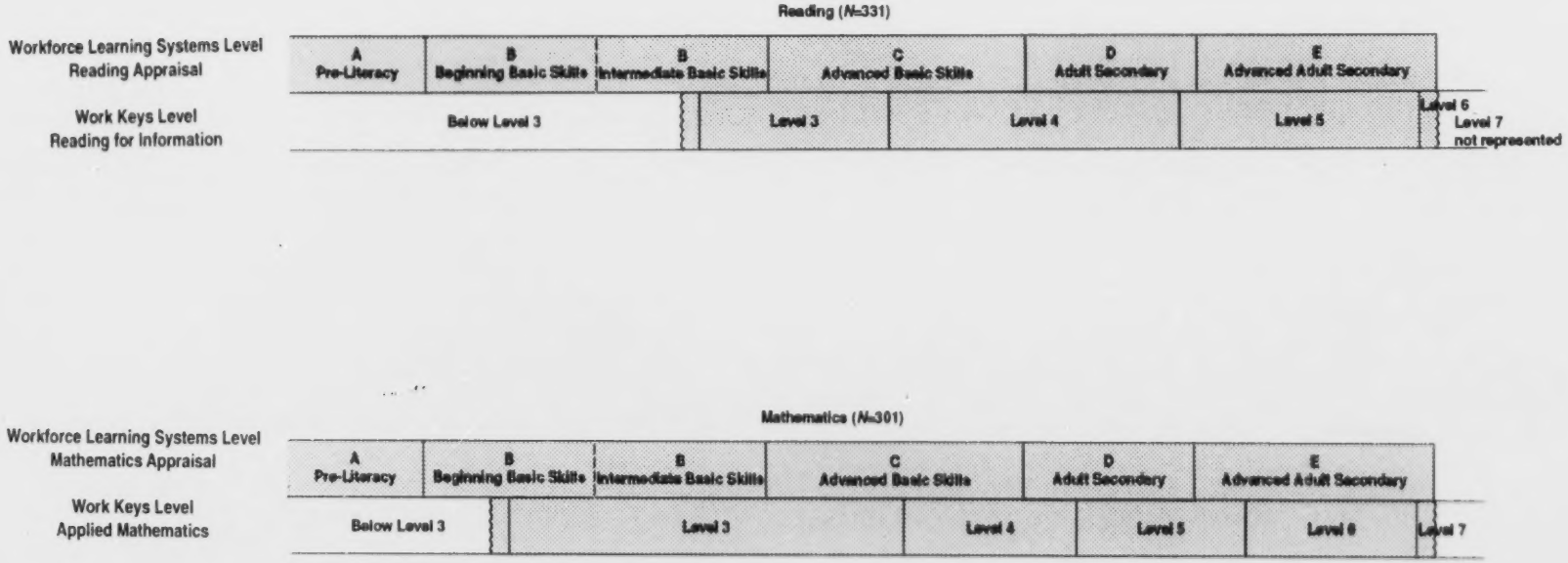
If showing the relationships between the scales has the desired effect of extending the scale, it should be possible to see a contrast between CASAS Workforce Learning Systems and ACT Work Keys in the differentiation of levels at one end of the scale. That is, one would expect that at the lower end of the skill scales, the CASAS Workforce Learning Systems scale would differentiate several levels where the ACT Work Keys scale does not.

This is in fact the case. For reading, all of CASAS Workforce Learning Systems level A and most of level B are below ACT Work Keys level 3. For mathematics, all of CASAS Workforce Learning Systems level A and about half of the lower portion of level B (Beginning Basic Skills) are below ACT Work Keys level 3. This shows that Workforce Learning Systems is providing the desired extension below Work Keys level 3 in both skill areas.

Figure 3.1

Comparison Between CASAS Workforce Learning Systems and ACT Work Keys™ Levels Using the CASAS Scale

Based on a Fall 1996 Study of Adult Students



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The relationships, when starting with the ACT Work Keys scales and determining how the CASAS Workforce Learning Systems scales relate to them, are shown in figure 3.2. The top bar in each section of the graphic shows the ACT Work Keys scale, and the bottom bar shows where the CASAS Workforce Learning Systems levels can, on average, be linked to that scale. In this case, the average CASAS Workforce Learning Systems scaled scores of all of the examinees at each ACT Work Keys theta score were calculated. This created a correspondence between each Work Keys theta score and the average Workforce Learning Systems scores on the CASAS scale for every Work Keys theta score attained by at least one study participant.

Mapping the CASAS scale onto the Work Keys level scale was then achieved by matching the Workforce Learning Systems scaled scores at the end points of each CASAS level with their corresponding Work Keys theta scores on the Work Keys scale. For example, the high end of CASAS level B and low end of CASAS level C is between 220 and 221 on the CASAS scale. In figure 3.2, this point on the CASAS scale was mapped onto its corresponding Work Keys theta score, which, for mathematics, is about two-thirds of the way into Work Keys level 3. Corresponding theta scores were found for the end points of each CASAS level, in order to show how the CASAS Workforce Learning Systems levels would relate, *on average*, to the ACT Work Keys levels.

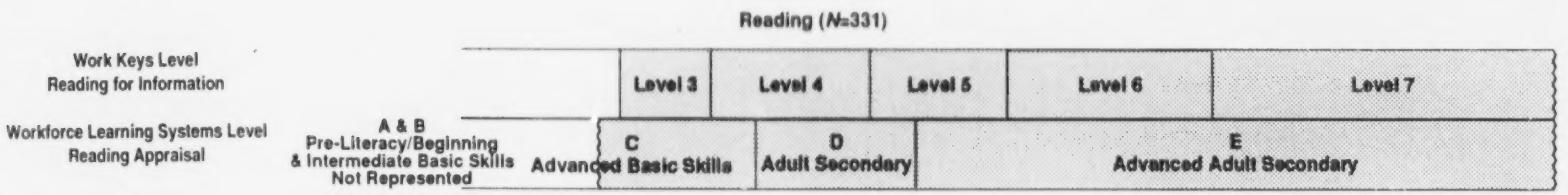
Again, if identifying the relationships between the scales for each skill area has the desired effect of extending the scales, it should be possible to see a contrast between Work Keys and Workforce Learning Systems in the differentiation of levels at the top end of the scales. That is, one would expect that at the upper end of the score scales, the ACT Work Keys scales for reading and mathematics would differentiate several levels where the CASAS Workforce Learning Systems scales do not.

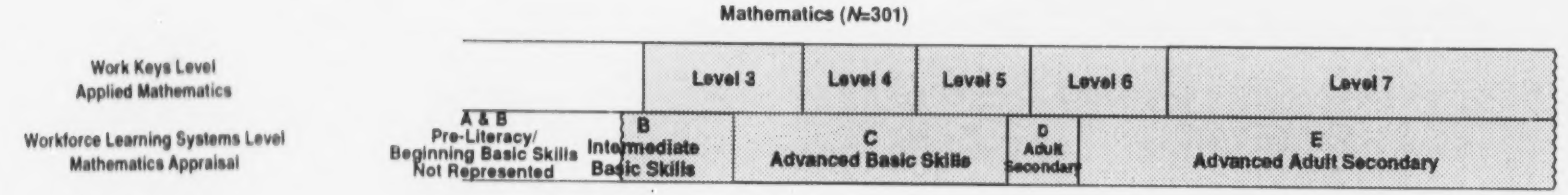
This also appears to be the case. For reading, where ACT Work Keys distinguishes between level 5, level 6, and level 7, CASAS Workforce Learning Systems level E corresponds to both levels 6 and 7, and to part of level 5 as well. In mathematics, CASAS Workforce Learning Systems level D corresponds to a small portion of the top of ACT Work Keys level 5 and about the first third of level 6, and CASAS Workforce Learning Systems level E corresponds to the remainder of ACT Work Keys level 6 and a significant part of level 7. The Work Keys scale, then, does provide additional differentiation at the top end of both skill scales.

Figure 3.2

Comparison Between CASAS Workforce Learning Systems and ACT Work Keys™ Levels Using the Work Keys Scale

Based on a Fall 1996 Study of Adult Students





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Caveats

Appropriate use of the Workforce Learning Systems/Work Keys score articulation depends on the circumstances of the examinee and on the intended use of the score. For many reasons, it is not appropriate to simply substitute either score for the other. Neither test is perfectly reliable, and the correlation between them is also less than perfect. For any given examinee, the relationship between the two test scores may not, as a result, be exactly the same as the average relationship between the scores.

The examinees were not fully representative of either Workforce Learning Systems or Work Keys examinee populations, and some of them may not have been highly motivated to achieve on one or both tests. This could lead to anomalies in the data, especially at the ends of the scale where relatively few examinees scored, as a single unusual response there could have a greater impact on the average relationship between the scales. Therefore, in high-stakes decisions and other situations demanding the most accurate information, each individual should use the assessment that is most appropriate to his or her particular situation.

Applying the Results: How to Interpret the Information from this Study

The Workforce Learning Systems and Work Keys programs can be articulated to more fully meet the needs of adult learners. Just how their articulation can be used depends on the level at which an individual enters the program and the intended use of the score. By articulating these two systems, it is possible to allow individuals to be assessed upon entering an instructional program at whatever level they are currently functioning, and to provide assessment to support their eventual transitions into the workplace as they reach the skill levels required by employers.

The next four tables (Tables 3.5 to 3.8) may be used to *estimate* what level a person with Workforce Learning Systems scores might achieve on the Work Keys assessments, and what level a person with Work Keys scores might achieve on the Workforce Learning Systems assessments. They have been designed to help practitioners *use the study results* to provide learners, employees, and others who have scores on one assessment with information about how they might score on the other.

There are two tables for the reading assessments (Tables 3.5 and 3.7): one based on the CASAS Workforce Learning Systems scale (Table 3.5) and the other based on the ACT Work Keys scale (Table 3.7). There are also two similar tables for the mathematics assessments (Tables 3.6 and 3.8). All of the tables are to be read in the same way. Start by looking in the leftmost column for the score level that matches the score the person already has. Then, read across that row to find the chances in 100 (the probability) that the individual would have each of the different level scores on the other test for the same skill area.

Table 3.5, for example, shows that if an individual has an ACT Work Keys reading score level 4, he or she has 2 chances in 100 of having a CASAS Workforce Learning Systems reading level of B, 44 chances in 100 of having a CASAS Workforce Learning Systems reading level of C, 47

chances in 100 of having a CASAS Workforce Learning Systems reading level of D, and 7 chances in 100 of having a CASAS Workforce Learning Systems level of E. That is, if this person were to take the Workforce Learning Systems reading test, he or she would probably score at the C or D level.

These tables are more complete than the graphic scales shown in Figures 3.1 and 3.2. They make it clear that a level on either test is related to more than one level on the other. The scales shown in Figures 3.1 and 3.2 do not show this information because they are based on average scores. These tables make it clear that a level on either test is related to more than one level on the other. The information presented in these four tables, along with other information about examinees, can help educators, training specialists, and counselors make better instructional decisions.

These tables also provide one additional piece of useful information: the number of examinees in this study at each level. For example, Table 3.5 shows that for Work Keys reading level 4 there were 128 examinees in the study. One person represents 1/128 or about .7 percent of the sample. The percentages based on 128 examinees should be reasonably stable because it would take quite a few examinees scoring in a particular way to change the percentage at a given level.

However, observe the Work Keys reading score at level 7. With only 11 examinees in the study on which to base percentages, the score of a single examinee can make quite a difference. One examinee represents 1/11 of the sample or about 9 percent. Therefore, we can know that one of the examinees who scored at level 7 in reading on Work Keys scored at level D on Workforce Learning Systems, and the other ten scored at level E. With so few examinees at a level, the percentages at these levels must be interpreted with greater caution.

Table 3.5
Expected CASAS Workforce Learning Systems Reading Levels as Indicated by ACT Work Keys Scores

ACT Work Keys Reading for Information Score	Chances in 100 of each CASAS Workforce Learning Systems Reading Level				
	Level A	Level B	Level C	Level D	Level E
Below 3 (*N*=53)	4	43	53		
Level 3 (*N*=55)		16	66	14	4
Level 4 (*N*=128)		2	44	47	7
Level 5 (*N*=58)		2	12	41	45
Level 6 (*N*=26)		4	8	8	81
Level 7 (*N*=11)				9	91

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

Table 3.6
Expected CASAS Workforce Learning Systems Mathematics Levels as Indicated by ACT Work Keys Scores

ACT Work Keys Applied Mathematics Score	Chances in 100 of each CASAS Workforce Learning Systems Mathematics Level				
	Level A	Level B	Level C	Level D	Level E
Below 3 (*N*=51)	10	76	14		
Level 3 (*N*=105)		55	43	1	1
Level 4 (*N*=91)		26	57	16	
Level 5 (*N*=35)		9	46	43	3
Level 6 (*N*=13)			8	54	38
Level 7 (*N*=6)				17	83

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

Table 3.7
Expected ACT Work Keys Reading Levels as Indicated by CASAS Workforce Learning Systems Scores

CASAS Workforce Learning Systems Reading Score	Chances in 100 of each ACT Work Keys Reading for Information Level					
	Below 3	Level 3	Level 4	Level 5	Level 6	Level 7
Level A (*N*=2)	100					
Level B (*N*=36)	64	25	6	3	3	
Level C (*N*=121)	22	28	44	5	2	
Level D (*N*=39)		8	63	25	2	1
Level E (*N*=12)		3	13	38	31	15

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

Table 3.8
Expected ACT Work Keys Mathematics Levels as Indicated by CASAS Workforce Learning Systems Scores

CASAS Workforce Learning Systems Mathematics Score	Chances in 100 of each ACT Work Keys Applied Mathematics Level					
	Below 3	Level 3	Level 4	Level 5	Level 6	Level 7
Level A (*N*=5)	100					
Level B (*N*=124)	32	47	19	3		
Level C (*N*=121)	6	37	43	13	1	
Level D (*N*=39)		3	38	38	18	3
Level E (*N*=12)		8		8	42	42

Note: The rows may not sum to 100 due to rounding. Column totals are not meaningful.
CASAS and ACT, 1997

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Summary of Major Findings

The relationships between the CASAS Workforce Learning Systems and ACT Work Keys scales do offer the anticipated extension ladder effect, with CASAS Workforce Learning Systems extending below and differentiating more levels at ACT Work Keys level 3 in both skill areas, and ACT Work Keys differentiating more levels at the upper end and extending above CASAS Workforce Learning Systems. Therefore, the CASAS Workforce Learning Systems and ACT Work Keys scales can be articulated, with the effectiveness of their use depending on the level at which a student enters the program and on the intended use of the score.

Although the relationship between the score scales for each skill area is strong enough to permit scores on one test to be *estimated* from scores on the other, scores on one test *may not be directly substituted* for scores on the other for the same skill area.

Tables 3.5 to 3.8 may be used to *estimate* what level a student with Workforce Learning Systems scores might achieve on the Work Keys assessments, and what level a student with Work Keys scores might achieve on the Workforce Learning Systems assessments.

Chapter Four

Conclusions, Recommendations, and Potential Uses

This chapter reports the conclusions, recommendations and potential uses of the study results. The conclusions were based on the results presented in Chapter Three. The recommendations were based on the conclusions. They are designed to be of assistance to educators, trainers, and human resource managers. The "Potential Uses" section presents some practical scenarios for utilizing the results of this study.

Conclusions

- Both CASAS' Workforce Learning Systems and ACT's Work Keys system measure basic and more advanced skills needed for effective participation in the workforce and workplace.
- There is enough *commonality* in both the content and range of skills covered by the Workforce Learning Systems and Work Keys system to determine a meaningful connection between the two.
- There is enough *difference* in the range of skills covered by the Workforce Learning Systems and Work Keys system to warrant joining the two together in a basic skills continuum. This continuum provides more useful information over a greater range of skill levels than is available from either system alone.
- The Workforce Learning Systems covers skills that are more basic, and provides more information on the skills of individuals functioning at the *lower* end of the skills continuum.
- The Work Keys system covers skills that are more advanced, and provides more information on the skills of individuals functioning at the *higher* end of the skills continuum.
- The Workforce Learning Systems and Work Keys system complement each other, and can be used together to provide a smooth, progressive, and complete skills continuum.
- A statistical relationship exists between the CASAS Workforce Learning Systems and the ACT Work Keys system scales that can be used to *estimate* scores on one assessment from scores on the other.
- It is not appropriate to *substitute* scores on one assessment with those from the other.

Recommendations

- Educators, trainers, and human resource managers can use the Workforce Learning Systems and the Work Keys system *in tandem* to help individuals progress along a broad skills continuum, from their current skill levels to the skill levels required for successful participation in the workforce.

- Educators, trainers, and human resource managers can use the *Workforce Learning Systems assessments* with individuals whose skills are on the *lower* end of the skills continuum.

- Educators, trainers, and human resource managers can use the *Work Keys system assessments* with individuals whose skills are on the *higher* end of the skills continuum.

- Educators, trainers, and human resource managers can use the assessments of either the Workforce Learning Systems, the Work Keys system, or the two systems together with individuals whose skills are in the *mid range* of the skills continuum.

Potential Uses

For Those Using the Workforce Learning Systems

- Individuals who have already been tested with a Workforce Learning Systems assessment can use the tables in this publication to *estimate* how they would perform on a Work Keys assessment, and determine whether it would be worthwhile for them to take that assessment now. This would be valuable in cases where the individuals assessed with Workforce Learning Systems needed to meet a Work Keys standard, perhaps for a new job or a promotion. Individuals with a low probability of being able to score at the desired level should pursue further training before taking a Work Keys assessment. Individuals with a high probability of scoring at the desired level would not need to wait to take a Work Keys assessment.

  For example, Table 3.7 shows that an individual assessed at level B on the CASAS reading scale would have a 12 percent chance of scoring at or above level 4 on the Work Keys Reading for Information assessment (6% chance of scoring at level 4 + 3% chance of scoring at level 5 + 3% chance of scoring at level 6). Individuals needing to score at level 4 in order to be eligible for a specific job might be well advised to engage in more study before taking a Work Keys assessment.

- Individuals in CASAS-based education and training programs can use Work Keys Occupational Profiles, along with the tables in this publication, to *estimate* the CASAS scale scores they would need in order to meet the reading and mathematics requirements for specific occupations. Work Keys has developed profiles on a number of occupations by combining the results of occupational job analyses conducted in specific companies.

For example, a Work Keys Occupational Profile for licensed practical nurses shows that individuals interested in pursuing that occupation would need a score of level 6 on the Work Keys Reading for Information assessment. Table 3.7 shows that individuals at CASAS level A have no chance of meeting this standard, while those at CASAS levels B, C, and D have only a very small chance of meeting this standard (3% for level B, 2% for level C, and 3% (2% plus 1%) for level D).[6] Because those scoring at CASAS level E have a 46 percent chance (31% + 15%) of meeting this standard, individuals interested in pursuing this job should probably continue their studies until they are able to achieve a score at the upper end of CASAS level E.

- Individuals can also use the results from this study, along with their Workforce Learning Systems scores, to gauge their progress toward meeting a Work Keys level. Table 4.1 shows the CASAS scale score at which an examinee has a 50-50 chance of scoring at a specified Work Keys level.

Table 4.1
CASAS Workforce Learning Systems Scale Score at which an Examinee Has a 50-50 Chance of Scoring at a Specified ACT Work Keys Level

Workforce Learning Systems Reading Score	Work Keys Level	Workforce Learning Systems Mathematics Score
229	3	221
238	4	230
250	5	237
260	6	244
N/A	7	258

N/A - Data not sufficient to estimate this number.
CASAS and ACT, 1997

Table 4.1 shows, for example, that individuals with Workforce Learning Systems mathematics scores of 221 have a 50-50 chance of testing at Work Keys level 3 on the Applied Mathematics assessment. Those with Workforce Learning Systems mathematics scores of 230, have a 50-50 chance of testing at Work Keys level 4. Individuals who raise their Workforce Learning Systems mathematics scores from 221 to 230 have, therefore, moved from a probable Work Keys level 3 to a probable Work Keys level 4.

[6]As mentioned earlier, the small number of participants scoring at the extremes of the CASAS Workforce Learning Systems and ACT Work Keys system scales makes the study results less reliable in these areas. This is why table 3.7 suggests that those at CASAS level C are slightly less likely to score at Work Keys level 6 than are those at CASAS level B.

- Individuals scoring in CASAS level E can gain further information on their skills and abilities by taking the Work Keys assessments. Moving from the Workforce Learning Systems to the Work Keys system enables these individuals to take advantage of the upward extension offered by the Work Keys system.

For Those Using Work Keys

- Individuals who have already been tested with a Work Keys assessment can use the tables in this publication to *estimate* how they would perform on a Workforce Learning Systems assessment, and determine whether it would be worthwhile for them to take that assessment now. This would be valuable in cases where the individuals assessed with Work Keys needed to meet a Workforce Learning Systems standard. Individuals with a low probability of being able to score at the desired level should pursue further training before taking the Workforce Learning Systems test. Individuals with a high probability of scoring at the desired level would not need to wait to take the Workforce Learning Systems test.

  For example, Table 3.6 shows that an individual with a Work Keys Applied Mathematics score of level 3 would have a 45 percent chance of scoring at or above CASAS level C on the Workforce Learning Systems reading assessment (43% chance of scoring at level C + 1% chance of scoring at level D + 1% chance of scoring at level E). Individuals needing to score at CASAS level C might choose to study a little longer, or take the Workforce Learning Systems assessment right away.

- Individuals in Work Keys-based education and training programs can use the CASAS Materials Guide, along with the tables in this publication, to select appropriate curriculum and instruction materials. The CASAS guide correlates over 1,000 commercially available instructional textbooks, videos, and software programs to more than 300 competency statements (or learning objectives).

  For example, Table 3.5 shows that individuals with an ACT Work Keys reading score of level 3 have a 66 percent chance of scoring at CASAS Workforce Learning Systems level C. These individuals should select instructional materials in the CASAS guide geared toward CASAS level C. Table 3.6 shows that individuals with an ACT Work Keys mathematics score of level 6 have a 54 percent chance of scoring at CASAS Workforce Learning Systems level D. These individuals should select mathematics instructional materials geared toward a CASAS level D.

- Individuals in Work Keys-based education and training programs can use CASAS research to *estimate* how long it would take them to move from one Work Keys level to the next. Research on individuals within the CASAS system has shown an average increase of 5 points along the CASAS scale for every 100 hours of instruction.

  Table 4.2 combines the results from this study showing the *relationship* between the Workforce Learning Systems and Work Keys scores, and CASAS research indicating the average amount of time needed to advance along the CASAS scale. This provides estimates of the amount of time individuals would need to advance from one Work Keys level to the next.

Table 4.2
Estimated Hours of Instruction Needed
to Move from One Work Keys Level to the Next

Work Keys Assessment Instrument	HOURS OF INSTRUCTION			
	From Level 3 to 4	From Level 4 to 5	From Level 5 to 6	From Level 6 to 7
Reading for Information	120	180	240	N/A
Applied Mathematics	100	180	140	140

Based on CASAS research on individuals using CASAS assessment instruments. Hours are estimated based on moving from the *beginning* of one level to the *beginning* of the next level.
N/A - Data not sufficient to estimate this number.
CASAS and ACT, 1997

The *estimates* in Table 4.2 will be most accurate for individuals typical of those served by CASAS (e.g., individuals in adult basic education), and in classes typical of those where CASAS assessments are used (e.g., classes of standard size with heterogeneous students). Initial information from industry-based training in which individuals scoring at the same Work Keys level were provided targeted instruction in the Work Keys skills suggests that Work Keys level advances can be made with as little as 25 hours of instruction. These results require highly motivated students with the prerequisite skills to benefit from the training; well designed, contextualized materials; and skilled instructors.

- Individuals scoring below Work Keys level 3 can gain further information on their skills and abilities by taking the Workforce Learning Systems assessments. Moving from the Work Keys system to the Workforce Learning Systems enables these individuals to take advantage of the downward extension offered by the Workforce Learning Systems.

For Those Using neither the Workforce Learning Systems nor Work Keys

Selecting the most appropriate assessment to use with an individual should depend first on the purpose of the assessment. If, for example, the purpose is to compare the individual's score with a standard based on a Work Keys job profile, a Work Keys assessment is required. If, on the other hand, the purpose of the assessment is to provide the individual with appropriate instruction based on the CASAS Instructional Materials Guide, a Workforce Learning Systems assessment is required.

If the purpose of the assessment does not suggest one assessment over the other, the results of this research can provide guidance on which assessment system would be most appropriate for a particular individual.

- Individuals likely to score below level 3 on the Work Keys assessments would be better served by the Workforce Learning Systems. Individuals likely to fall into this category include:

- Those who have not completed formal education beyond the eighth grade, and are believed to be functioning at or below this level, and

- Those with a limited command of English who are believed to be functioning at or below the eighth grade level.

- Individuals likely to score at CASAS level E on the Workforce Learning Systems assessments would be better served by the Work Keys system. Individuals likely to fall into this category include:

  - Those who have a high school diploma or GED, have completed at least one year of postsecondary education, and are believed to be functioning at or above a high school graduate level, and

  - Those who have worked successfully in a job requiring a Work Keys skill level of 6.

For Those Seeking a Comprehensive Assessment System

The results of this study can benefit the assessment efforts of education and training programs at state and local levels. Together, the Workforce Learning Systems and Work Keys system assess the broad range of skills programs are likely to encounter. By using these two systems in tandem, states and localities can operate a comprehensive, articulated assessment system, rather than a *potpourri* of unrelated assessment tests.

Together, the Workforce Learning Systems and Work Keys system form a solid *core* for a program's assessment efforts. By using the Workforce Learning Systems/Work Keys system assessments as a base, education and training programs will be able to ensure that any additional assessment instruments they use, such as interest inventories, are appropriate for the skill levels of the participants involved.

- The results of this study are particularly useful for states and localities establishing one-stop systems. One-stop facilities are designed to serve *any* individuals needing employment and training services, from welfare recipients to dislocated workers. With such a broad mandate, one-stop centers need a comprehensive assessment system appropriate to all comers.

  The Workforce Learning Systems and Work Keys system meet this need. Together, the systems can assess individuals along the entire range of the skills continuum. The Workforce Learning Systems can be used with individuals with limited English proficiency, and even learning disabilities, as well as those with low to mid-level basic skills. The Work Keys system, on the other hand, can assess individuals with more advanced skills, including those with technical and managerial experience.

- The results of this study will also help states and localities meet their responsibilities under the new Welfare Reform mandate. Many welfare recipients will begin their education and training programs at skill levels most appropriately measured by the Workforce Learning systems. Many welfare recipients will then need to continue their education and training programs (before or after employment) until they reach skill levels best measured by the Work Keys system.

Epilogue

The overarching reason for conducting this study was to provide a unique and innovative view of assessment in the workplace. This study links CASAS' Workforce Learning Systems and ACT's Work Keys system to provide education and training programs with a more extensive and comprehensive assessment capability. The effective use of these two systems, functioning in tandem, can identify training needs at the skill level of the individual and support continued training to the requisite levels mandated by business and industry for occupations requiring higher skill levels.

In the accelerated labor market of the twenty-first century, business and industry will constantly be looking for a highly trained workforce. The effective use of relevant assessment tools will increase companies' probability of gaining the greatest return on investment for the training dollars spent on the workforce. The effective use of the two assessment systems linked in this study will help secure a high return on investment for continued training and upgrading of the American workforce.

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Appendix A

List of Participating States and Data Collection Sites

List of Participating States and Data Collection Sites

PARTICIPATING STATE	CONTACT PERSON	DATA COLLECTION SITE
California	Jane Equez CASAS 8910 Clairmont Mesa Blvd. San Diego, CA 92123-1104	Ann Marie Damrau San Diego Community College Center City - VESL Coordinator 1400 Park Blvd. San Diego, CA 92101 Marjorie Knowles Mission College - 3000 Mission Coll. Blvd. MS #1 Santa Clara, CA 95054-1897 Sylvia Ramirez Mira Costa College 320 N. Home St. Oceanside, CA 92054
Connecticut	Jim Harrison Connecticut Dept. of Education 25 Industrial Park Road Middletown, CT 06457	Judith Baldwin Area Cooperative Educational Services 5 Science Park New Haven, CT 06511 Jay Cretella Wallingford Adult Education 37 Hall Avenue Wallingford, CT 06492 Nick Lavorato Applied Engineering Products 104 John W. Murphy Drive P.O. Box 510 New Haven, CT 06513 Reina Marasco Valley Regional Adult Education 415 Howe Avenue Shelton, CT 06484 David Talbot EASTCONN Northeast Learning Center 111 Connecticut Mill Ave. Danielson, CT 06239

PARTICIPATING STATE	CONTACT PERSON	DATA COLLECTION SITE
Iowa	John Hartwig Iowa Department of Education Grimes State Office Bldg. Des Moines, IA 50319-0146	Cindy Burnside Indian Hills Community College 525 Grandview Ottumwa, IA 50801 Mary Enlz Des Moines Area Comm. College 2006 S. Ankeny Blvd., Bldg. 18 Ankeny, IA 50021 Peg Garrison Jim Schneider Eastern Iowa Comm. Coll. Dist. 627 W. 2nd Davenport, IA 52801 Marty Lundberg North Iowa Area Comm. College 500 College Drive Mason City, IA 50401 Kay Nebergall Kirkwood Community College Lincoln Learning Center P.O. Box 2068 Cedar Rapids, IA 52406
Kansas	Dianne S. Glass Kansas Dept. of Education 120 East 10th Street Topeka, KS 66612	Charlotte Hearn Fort Scott Community College 2108 South Horton Fort Scott, KS 66701 Janice Kelly Wichita Area Technical College 301 S. Grove Wichita, KS 67211 Phil Wegman Johnson County Comm. College 12345 College at Quivers Road Overland Park, KS 66210

PARTICIPATING STATE	CONTACT PERSON	DATA COLLECTION SITE
Maryland	Beth Anagnostopoulos Program - USWA - Bethleham Steel Career Develop. Prog. Sparrows Point Division Sparrows Point, MD 21219	Program - USWA - Bethlehem Steel Center Develop. Program Sparrows Point Division Sparrows Point, MD 21219
Minnesota	Brian Kanes Adult Basic Education Minnesota Dept. of Education 995 Capitol Square Bldg. St. Paul, MN 55101	Faith McCaghy Community Education Bldg. 8755 Upper 208th St. West Lakeville, MN 55044 Dawn Neton Alternative Learning Center 223 East 7th Street Crookston, MN 56716 Faye Petersen Carver-Scott Cooperative 401 East 4th Street Chaska, MN 55318 Lynn Swanson Metro East Adult Basic Ed. Ronald H. Hubbs Center for Lifelong Learning 1030 University Ave. West St. Paul, MN 55104-4706
Nebraska	Connie Eichhorn Omaha Public Schools 3215 Cuming St. Omaha, NE 68131-2024	Omaha Public Schools 3215 Cuming St. Omaha, NE 68131-2024

PARTICIPATING STATE	CONTACT PERSON	DATA COLLECTION SITE
Oregon	Sharlene Walker Oregon Dept. of Education 255 Capitol St., NE Salem, OR 97310-0203	Pat Amsberg Blue Mountain Comm. College P.O. Box 100 Pendleton, OR 97801 Dawn DeWolf Oregon Coast Comm. College 332 S.W. Coast Highway Newport, OR 97365 Mary Louise Doran Rogue Community College 3345 Redwood Highway Grants Pass, OR 97527 Linnell Rantapaa Oregon State Corrections Education Division 2575 Center St. NE Salem, OR 97310 Leslie Rasor Lane Community College 4000 East 30th Eugene, OR 97405

Appendix B

Proposal Letter to Dr. Andrew Hartman

May 1, 1996

Dr. Andrew Hartman
Executive Director
National Institute for Literacy
800 Connecticut Avenue, NW
Suite 200
Washington, D.C. 20202-7560

Dear Andy:

Pursuant to our recent conversation at the State Directors' meeting, I am sending a follow-up letter regarding a proposed research study. The attached draft proposal, which is still evolving, was developed by Dr. Joel D. West, executive director, ACT Center for Education and Work and Ms. Patricia L. Rickard, executive director of CASAS. The overall purpose of this study is to examine the relationship between two national assessment systems, (CASAS and Work Keys) and determine where the linkages between the two systems may be strengthened.

I have discussed this research proposal with key state directors who perceive this type of study is needed with the advent of block grant legislation. I believe the proposal outlines the overall strategies, intent and purposes of the study.

The following is a listing of states who have committed to participate in the study including the proposed number of data collection sites within each state.

Participating State	Number of Sites
Iowa	5
Kansas	3
Minnesota	3
Oregon	2-4
California	3
Connecticut	3-5
Nebraska	1
TOTAL	20-23

Each data collection site would assess 15 to 20 examinees, bringing the total number of examinees within a range of 400 to 450. Pat, Joel and I perceive this would be an adequate number of examinees to constitute a national sample.

The project is seeking funding from the National Institute for Literacy in the amount of $12,000 to $15,000 to support the research. Specifically, this funding will cover the following expenses: (1) qualified proctors or teachers to administer the assessment instruments, (2) provide each examinee with a pocket calculator for taking the mathematics assessment or a pocket dictionary for taking the reading assessment. This strategy will provide a motivation for examinees to perform at optimum levels. As the proposal indicates, the data collection phase of the project is scheduled for mid-September through late October 1996. Therefore, there is time for discussion or to answer further questions.

On a personal note, I perceive that participating states know this study is essential as the results will assist practitioners to accurately assess target populations to develop work force capabilities. The timing for this study is excellent due to the demand for accountability and performance standards. The results will assist states to develop effective assessment strategies.

If you need further information please let me know. I will be looking forward to hearing from you.

Sincerely yours,

John Hartwig, Ph.D.
CASAS/Work Keys Project Director

JH/bse

cc: Patricia L. Rickard, Linda Taylor, Jane Eqüez: CASAS - CA
Dr. Joel D. West: ACT - IA
Jim Harrison - CT
Dianne S. Glass - KS
Brian Kanes - MN
Connie Eichhorn - NB
Dr. Sharlene Walker - OR
Marty Lundberg, Peg Garrison, Jim Schneider, Kay Nebergall,
Mary Entz, Cindy Burnside, Christine Case, Mary Strom - IA

Appendix C

Sample Assessment Items Referencing Reading and Mathematics for CASAS Levels A and E and Work Keys Levels 3 and 7

Sample Reading Item at CASAS Level A, <200

Competency 4.1.3: Identify and use sources of information about job opportunities such as job descriptions, job ads, and announcements, and about the workforce and job market.

CASHIER
MUST BE 21
APPLY IN PERSON
3 - 5 P.M.
214 16TH STREET

How do you apply for this job?

A. Write a letter.
B. Call on the telephone.
C. Go to 214 16th Street.
D. Send a friend.

Sample Reading Item at CASAS Level E, 246+

Competency 4.3.2: Interpret work safety manuals and related information.

IDENTIFICATION OF HEALTH HAZARD **Type of Possible Injury**	
LEVEL	
4	Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given.
3	Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.
2	Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
1	Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
0	Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustibles.

Which of the following best describes the purpose of this information?

A. It is a listing of common health hazards and possible injuries.
B. It is a set of precautions that should be taken when hazardous materials are handled.
C. It is a system for classifying materials according to the health risk they present.
D. It is a table identifying the medical treatment indicated for various levels of exposure to hazardous materials.

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MEMO

To: All businesses in Logan City Mall
From: Philip Charles, Logan City Mall Manager
Re: New garbage collection rules

Logan City Mall has hired a new garbage collection company. Speedy Sanitation, Inc. will be collecting garbage from all businesses starting next Monday. Collection days will not change. The pick-up time will be one hour later.

Each business will be given one blue garbage can to use. Each business may ask for 2 extra garbage cans. You may have a total of 3 garbage cans. You will not need yellow collection tags anymore. Full garbage cans must weigh less than 30 pounds. Put your garbage in bags before putting it in the garbage cans. Put your garbage cans in the alley behind your business's back door.

1. Starting next Monday, what is the greatest number of garbage cans each business is allowed to have?

A. 1
B. 2
C. 3
D. 15
E. 30

Level 7 Work Keys Reading for Information *example item*

Section 108

a) Notwithstanding the provisions of Section 106, it is not an infringement of copyright for a library or archive, or any of its employees acting within the scope of their employment, to reproduce no more than one copy or phonorecord of a work, or to distribute such copy or phonorecord under the conditions specified by this section if

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2) the collections of the library or archive are (i) open to the public, or (ii) available not only to researchers affiliated with the library or archive or with the institution of which it is a part, but also to other persons doing research in a specialized field; and
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2. Based on the information above, which of the following conditions would prohibit a city employee from photocopying an unpublished manuscript?

A. If the photocopy is to be sent to a public research library that does not have a copy of the manuscript
B. If the photocopy would not produce any income for the city library
C. If the city library's original copy of the manuscript is in danger of damage through use
D. If the city library is accessible to any and all citizens and researchers
E. If the employee makes only one copy of the manuscript as a secure transcription

Sample Mathematics Item at CASAS Level A, <200

Competency 4.1.3: Identify and use sources of information about job opportunities such as job descriptions, job ads, and announcements, and about the workforce and job market.

You started working at the time shown on clock A and stopped at the time shown on clock B. How long did you work?

A. 1 hour
B. 3 hours
C. 5 hours
D. 10 minutes

Sample Mathematics Item at CASAS Level E, 246+

Competency 4.7.3: Identify or demonstrate effective management of human resources, including assessing skills, making appropriate work assignments, and monitoring performance.

Wilma Santos works in a company that manufactures electrical equipment. She does the final assembly on regulator units. She keeps a log of the number of units she completes each day. She works five days a week. Below is her log for the week of August 2 through August 6.

PRODUCTION LOG

Name: Wilma Santos
Week: 8/2 - 8/6

Date	No. Units assembled
8/2	12
8/3	15
8/4	18
8/5	17
8/6	16
Weekly total	____
Daily average	____

The total for 8/6 is how much higher than the total for 8/2?

A. 4%
B. 13.3%
C. 25%
D. 33%

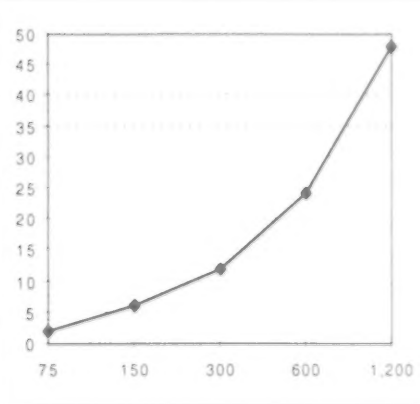
Level 3 Work Keys Applied Mathematics
example item

1. In your job as a cashier, a customer gives you a $20 bill to pay for a can of coffee that costs $3.84. How much change should you give back?

   A. $15.26
   B. $16.16
   C. $16.26
   D. $16.84
   E. $17.16

Level 7 Work Keys Applied Mathematics
example item

2. You operate a machine that stamps bottle caps out of 3-inch-by-3-inch aluminum squares. Occasionally, the machine produces an unusable cap, a reject, that must be recycled. The number of rejects made at different production rates is shown below. Today you have been told to produce 600 caps per hour. Approximately how many caps total should you have to produce to end up with your quota of 2,400 good ones?



   F. 2,400
   G. 2,448
   H. 2,521
   J. 2,548
   K. 2,616

Appendix D

Number of Examinees with Usable Scores by State and Data Collection Site

Table D.1

Number of Examinees with Usable Scores by State and Data Collection Site

State	Data Collection Site	Reading Only	Mathematics Only	Reading and Mathematics	Total Examinees
CALIFORNIA	Mission College	16	13	2	31
	Mira Costa Community College	8	10	5	23
	San Diego Community College	8	5	7	20
CONNECTICUT	Area Cooperative Educational Services	10	7	8	2
	EASTCONN	7	6	5	18
	Applied Engineering Products	0	0	12	12
	Valley Regional Adult Education	6	0	0	6
	Wallingford Adult Education	9	10	4	23
IOWA	North Iowa Area Community College	12	10	2	24
	Eastern Iowa Community College District	6	6	3	15
	Kirkwood Community College	12	5	1	18
	Des Moines Area Community College	10	13	0	23
	Indian Hills Community College	5	5	0	10
KANSAS	Fort Scott Community College	0	0	13	13
	Wichita Area Technical College	6	9	5	20
	Johnson County Community College	2	0	10	12
MARYLAND	USWA Bethlehem Steel Center	8	7	8	23
MINNESOTA	Metro East Adult Basic Education	8	10	2	20
	Carver-Scott Cooperative	0	0	2	2
	Alternative Learning Center	5	3	0	8
	Community Education Building	7	7	5	19
NEBRASKA	Omaha Public Schools	10	8	5	23
OREGON	Lane Community College	10	4	6	20
	Oregon State Corrections	10	9	5	24
	Blue Mountain Community College	0	1	17	18
	Rogue Community College	11	9	5	25
	Oregon Coast Community College	7	6	6	19
TOTAL		193	163	138	494

CASAS and ACT, 1997

Appendix E

Relationship Between Study Participants and Typical Examinees for Each Assessment Program

Relationship between Study Participants and Typical Examinees for Each Assessment Program

A number of the study participants were asked to complete both the reading and the mathematics assessments so that CASAS and ACT could check the internal consistency of their assessment instruments. Because examinees did not represent a national random sample, it was necessary for each organization to determine whether the relationship between study participants' reading and mathematics scores closely matched that of the much wider universe of individuals tested by its particular assessment system.

The correlation between the Workforce Learning Systems ECS 130 reading and mathematics scores for study participants was .62 (N=192). The comparable correlation for scores of a much larger group of individuals assessed by the ECS 130 was .65 (N=776). The correlation between Work Keys Reading for Information and Applied Mathematics scores for study participants was .60 based on the level scores (N=140). The comparable correlation for data from the Work Keys database was .58 (see Table E.1).

Table E.1
Correlation Coefficients between Individuals' Reading and Mathematics Scores for Each Assessment System

Population Tested	Workforce Learning Systems ECS 130	Work Keys
Study participants	.62	.60
Larger group of individuals tested with the assessment instrument	.65	.58

CASAS and ACT, 1997

The similar coefficients for the two Workforce Learning Systems populations, and the similar coefficients for the two Work Keys populations suggest that the study participants responded to the two assessment systems in much the same way that other examinees had. This increases the likelihood that the relationships found between the Workforce Learning Systems and Work Keys system in this study will be applicable to a larger population as well.

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